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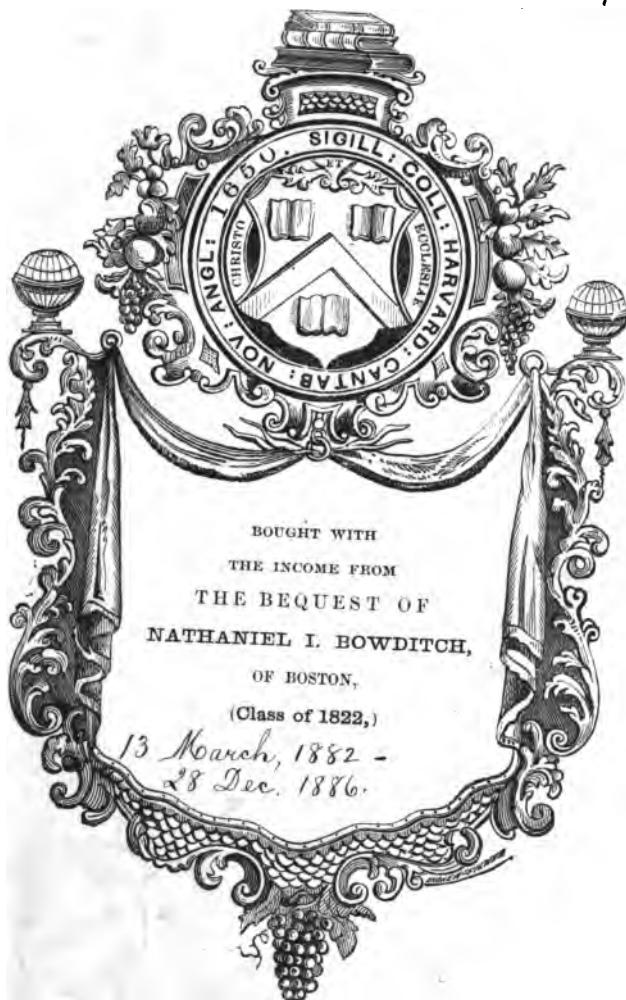
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THE  
MICROGRAPHIC DICTIONARY;  
A GUIDE TO THE EXAMINATION AND INVESTIGATION  
OF THE  
STRUCTURE AND NATURE  
OF  
MICROSCOPIC OBJECTS.

BY  
J. W. GRIFFITH, M.D., &c.,  
MEMBER OF THE ROYAL COLLEGE OF PHYSICIANS;  
AND  
ARTHUR HENFREY, F.R.S., F.L.S., &c.,  
PROFESSOR OF BOTANY IN KING'S COLLEGE, LONDON.

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FOURTH EDITION.  
EDITED BY  
J. W. GRIFFITH, M.D. &c.;  
ASSISTED BY  
THE REV. M. J. BERKELEY, M.A., F.R.S., F.L.S.,  
AND  
T. RUPERT JONES, F.R.S., F.G.S.,  
LATE PROFESSOR OF GEOLOGY, STAFF COLLEGE, SANDHURST.

ILLUSTRATED BY FIFTY-THREE PLATES AND EIGHT HUNDRED AND EIGHTEEN WOODCUTS,  
CONTAINING FIGURES OF 2680 OBJECTS.

VOL. II.—PLATES.  
LONDON:  
JOHN VAN VOORST, PATERNOSTER ROW.

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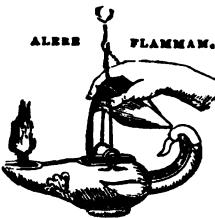
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1882, March 13-1886, Dec. 35.

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PRINTED BY TAYLOR AND FRANCIS,  
RED LION COURT, FLEET STREET.





## DESCRIPTION OF PLATES.

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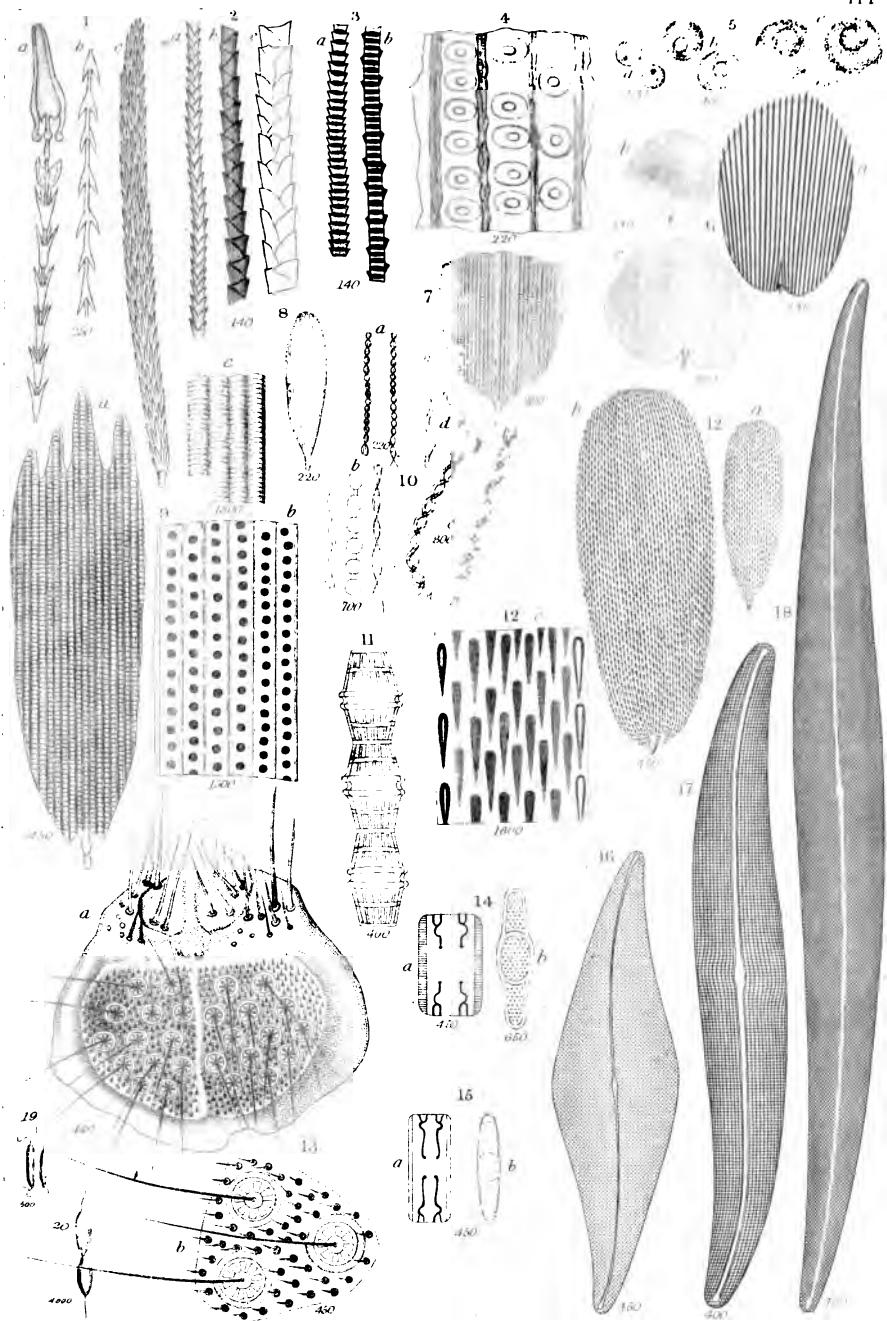
The diameters which each object is magnified, are expressed in the Plates by small numbers placed beneath the object.

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### PLATE 1.—Test-Objects.

#### Figure

1. Hairs of the larva of the so-called *Dermestes lardarius*, viewed in balsam.
2. Hairs of the common bat (*Vespertilio pipistrellus*), in balsam. *a*, *b*, coloured hairs; *c*, a white hair.
3. Hairs of mouse (*Mus musculus*), in balsam.
4. Pits of coniferous wood, common deal (*Abies excelsa*), viewed dry.
5. Mucus- (or salivary) corpuscles, seen under different powers.
6. Scales of *Lepisma saccharina*, dry.
7. Scale from the wing of *Morpho Menelaus*, dry.
8. Scale from underside of wing of common clothes-moth (*Tinea pellionella*), dry.
9. Scales of *Hipparchia janira*. *a*, dry, and by oblique light; *b*, in balsam, by direct light; *c*, dry, after Schacht.
10. *Didymohelix ferruginea*, under different powers; *b*, with imperfect correction or adjustment, *c* with perfect correction and adjustment; *d*, separate fibres.
11. *Didymoprium Borreri*, empty cells.
12. Scales of *Podura (Lepidocyrtus)*, under different powers, dry; *a*, 220 diameters; *c*, portion of scale—left hand, three markings as seen when the adjustment of the object-glass is correct and the markings in focus; right hand, showing the markings dividing when the adjustments are correct and the focus altered the least possible either way.
13. Pygidium of flea.
14. Frustule of *Grammatophora marina* (diagram). *a*, front view; *b*, side view.
15. Frustule of *Grammatophora subtilissima* (diagram). *a*, front view; *b*, side view.
16. *Pleurosigma angulatum*; dry valve showing the dots.
17. *Pleurosigma attenuatum*; dry valve showing the lines.
18. *Pleurosigma elongatum*; dry valve showing the lines.
19. *Bacillus subtilis*.
20. *Bacterium termo*.



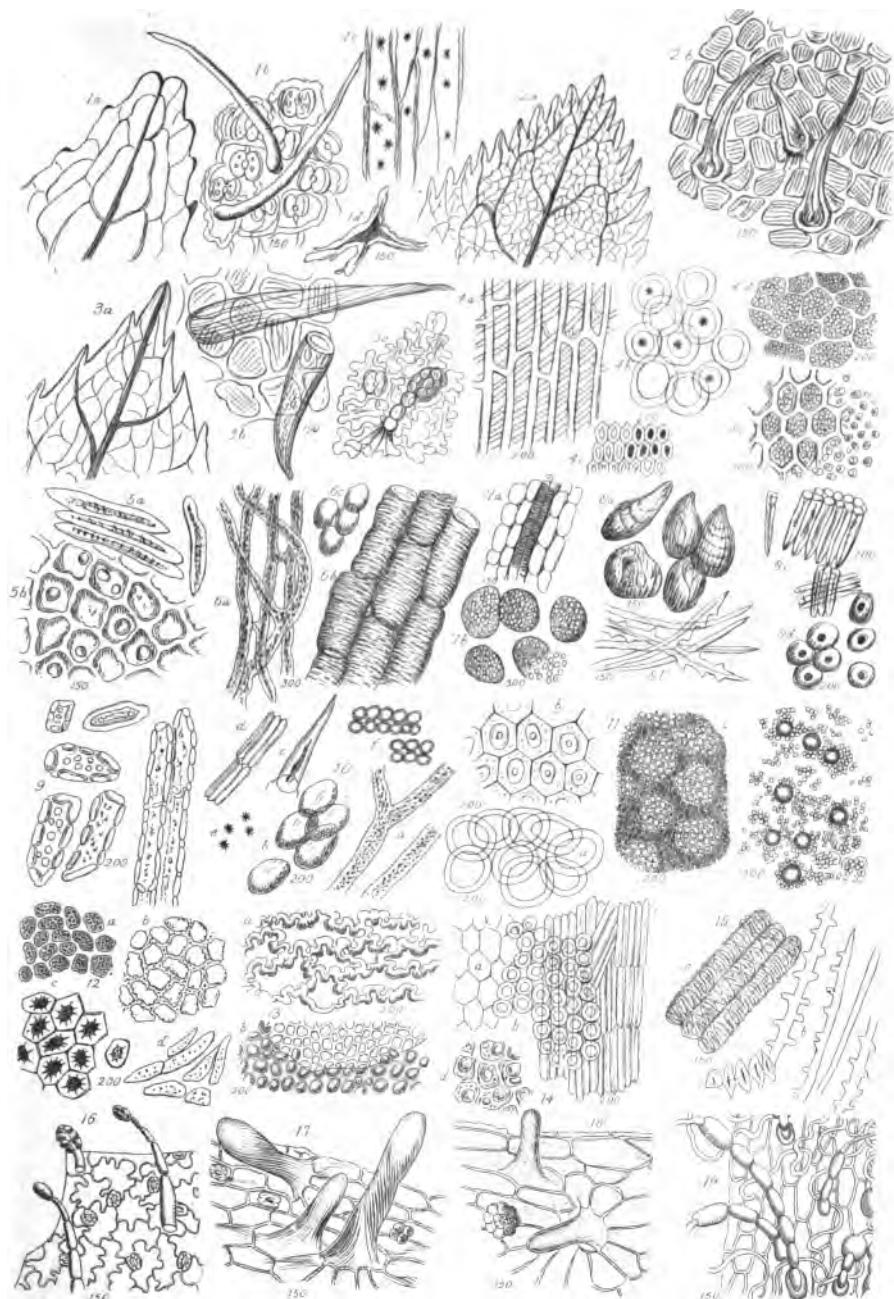




## PLATE 2.—Adulterations.

Figure

1. Tea. *a*, point of leaf; *b*, under surface, with stomata and hairs; *c*, epidermis of midrib with raphides; *d*, sclerogen cell from inside the leaf.
2. Tea and its adulterations. Sloe. *a*, point of leaf; *b*, upper surface, showing hairs and striated parenchyma.
3. Elder. *a*, point of leaf; *b*, upper surface; *c*, under surface of leaf, with sinuous striated cells and glandular hairs.
4. Cocoa. *a*, epidermis of husk; *b*, cells containing mucilage and raphides; *c*, hexagonal cells beneath the mucilage layer; *d*, parenchymatous granular cells, forming the inner layer of husk; *e*, endosperm-cells containing starch-grains.
5. Coffee. *a*, prosenchymatous cells of investing membrane of berry; *b*, thick-walled cells of endosperm, containing oil-globules.
6. Chicory. *a*, laticiferous vessels; *b*, pitted tissue; *c*, cellular tissue.
7. Acorns. *a*, portion of husk; *b*, cells of endosperm filled with starch.
8. Carob or locust-beans. *a*, *b*, characteristic tissues in pod; *c*, wedge-shaped, and *d*, sphærenchymatous cells of bean containing dark nuclei.
9. Date-stones. Sclerogen-cells of albumen.
10. Figs. *a*, laticiferous tissue; *b*, cellular tissue; *c*, a hair; *d*, woody tissue; *e*, sphæraphides; *f*, characteristic tissue in fig-seed.
11. Mustard. *a*, *b*, *c*, tissues in the husk; *d*, substance of the seed consisting of granular matter and oil-globules.
12. Pepper and its adulterations. Pepper. *a*, *b*, *c*, characteristic tissues in the husk; *d*, cells containing starch-granules.
13. Cayenne Pepper. *a*, very characteristic tissue; *b*, skin.
14. Linseed. *a*, epidermis; *b*, *c*, second and third tissues; *d*, endosperm with oil-globules.
15. Rice-husk. *a*, chief tissue of husk; *b*, the same broken up.
16. Tobacco. Epidermis of under surface of leaf, with glandular hairs.
17. Tobacco and its adulterations. Dock. Epidermis of under surface of midrib, showing unicellular twisted hairs.
18. Rhubarb. Epidermis of leaf, showing short unicellular pitted hairs.
19. Coltsfoot. Epidermis of leaf, showing peculiar jointed hairs with long whip-like appendages.







### PLATE 3.—Algæ.

Figure

1. *Agonium centrale.*
2. *Aphanocapsa virescens.*
3. *Aphanothecæ microscopica.*
4. *Amphithrix papillosa.*
5. *Asterothrix Pertyana.*
6. *Chamasiphon confervicola.*
7. *Chroolepus aureum.* b, the zoospores escaping.
8. *Cœlastrum Naegelei.*
9. *Coniophytum Thompsoni.*
10. *Craterospermum lœtivirens.*
11. *Dictyospherium Ehrenbergii.*
12. *Microcystis progenita.*
13. *Polyedrium spinosum.*
14. *Physodictyon graniforme.*
15. *Pilinia ramosa.*
16. *Schizochlamys gelatinosa.*
17. *Schizomeris Leibleinii.*
18. *Protoderma viride.*
19. *Prasiola calophylla.*
20. *Spermosira litorea.*
21. *Sphaerotilus natans.*
22. *Sorastrum spinosum.*
23. *Spondylomorium quaternarium.*
24. *Pleurocarpus mirabilis.*
25. *Stichococcus bacillaris.*
26. *Synechococcus æruginosus.*
27. *Zygomonium ericetorum.*
28. *Charcoococcus violaceus.*
29. *Palmodictyon viride.*
30. *Botryococcus Braunii.*
31. *Palmodactylon varium.*
32. *Bulbotrichia botryoides.*

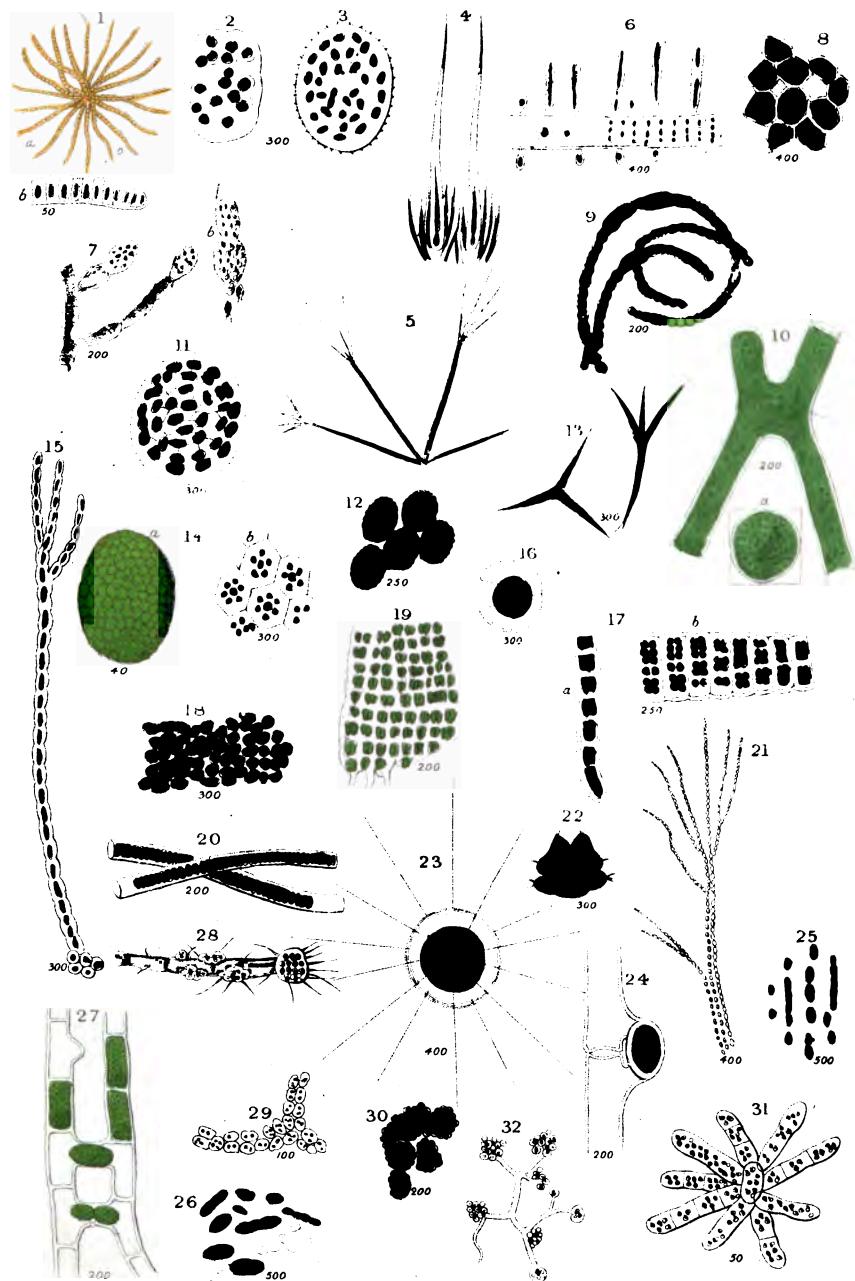






PLATE 4.—*Algae Florideæ.*

Figure

1. *Sporochnus pedunculatus*. a, portion of branch; b, receptacle; c, spores and filaments.
2. *Dictyota dichotoma*. a, portion of frond; b, sorus; c, section of the same with spores.
3. *Polyides rotundus*. a, frond with warts; b, favellidia from wart; c, section of frond and wart; d, spore.
4. *Phyllophora rubens*; b, spores; c, a nemathecium; d, filaments from the same.
5. *Delesseria sanguinea*; b, spores; c, a tetraspore; d, capsule; e, branch with coccidia.
6. *Nitophyllum punctatum*; b, a tubercle; c, a tetraspore; d, spores.
7. *Microcladia glandulosa*; b, favella; c, tetraspore; d, branch with favella.
8. *Rhodymenia Palmetta*; b, portion with sorus; c, tetraspores; d, coccidium.
9. *Dasya arbuscula*. a, portion of frond; b, branchlet with stichidia; c, a ceramidium.
10. *Plocamium coccineum*; b, branch with tubercles; c, branch with sporophylls; d, tetraspore; e, spore.
11. *Rytiphlaea pinastroides*; b, branch with ceramidia; c, stichidium; d, ceramidium.
12. *Nemaleon multifidum*. a, spermatozoa adherent to trichogyne; b, antheridia; c, carpogon.
13. *Odonthalia dentata*; b, stichidia; c, ceramidia; d, tetraspore; e, spore.
14. *Sphaerococcus coronopifolius*; b, portion with tubercles; c, a tubercle; d, spores.
15. *Bonnemaisonia asparagooides*; b, portion with ceramidia; c, ceramidium; d, spore.
16. *Ptilota plumosa*; b, c, favella; d, tetraspore.
17. *Gigartina acicularis*; b, c, tubercles with favellidia.
18. *Naccaria Wigghii* b, swollen ramuli with spores; c, filaments with spore.
19. *Bryopsis plumosa*; b, portion of branch magnified.
20. *Polysiphonia fastigiata*; b, portion magnified.
21. *Catenella opuntia*. a, nat. size; b, magnified 10 diam.; c, tetraspore.



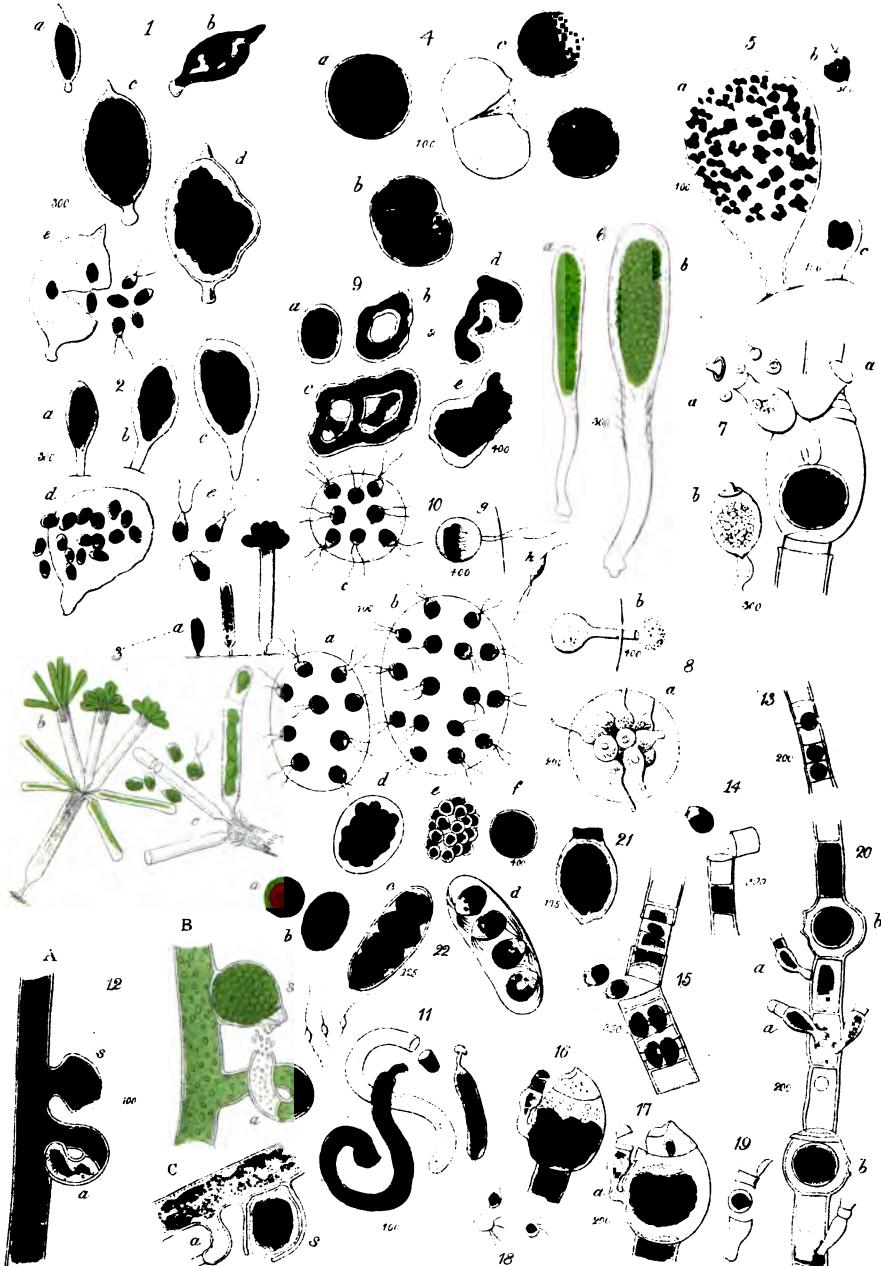




## PLATE 5.—Unicellular Algae, etc.

### Figure

1. *Hydrocytium acuminatum*. *a*, young plant; *b*, more advanced; *c*, older stage, with the gonidia divided; *d*, cell about to burst; *e*, cell burst and discharging zoospores.
2. *Characium Sieboldii*. *a*, *b*, *c*, successive stages of young plant; *d*, mature cell discharging its zoospores.
3. *Sciadum arbuscula*. *a*, young plants, the right-hand one setting free the gonidia of the second generation; *b*, an older plant with an umbel of secondary cells, some discharging their gonidia of the third generation; *c*, part of an umbel of cells from the last generation of a family, the gonidia being discharged as free zoospores.
4. *Chlorosphaera Oliveri*. *a*, perfect plant; *b*, a plant dividing into two; *c*, the same with the two new cells discharged from the parent.
5. *Apocystis Brauniana*. *a*, perfect plant; *b*, zoospore; *c*, germinating plant from a zoospore.
6. *Codiolum gregarium*. *a*, young plant; *b*, nearly mature.
7. *Chytridium Olla* upon an *Edogonium*. *a*, *a*, *Chytridia* burst and discharging their zoospores; *b*, a cell not yet open.
8. *Pythium entophytum* on *Chlorosphaera*. *a*, group, partly mature; *b*, side view of a single cell perforating the cell-wall of the *Chlorosphaera*, and with its neck opened, discharging the contents.
9. *Clathrocystis aeruginosa*. *a*, *b*, *c*, fronds in successive stages of growth, the natural colour; *d*, a frond dried; *e*, highly magnified fragment, showing the minute cells imbedded in the gelatinous frond.
10. *Pandorina Morum*. *a*, side view of active form with sixteen gonidia; *b*, side view of larger form with thirty-two gonidia; *c*, end view of *a*; *d*, form with crowded gonidia after fertilization, the cilia lost; *e*, the same more advanced, having lost the gelatinous common envelope, and the cell-contents red; *f*, a single encysted gonidium (resting-spore) from *e*, more magnified; *g*, side view of a gonidium with the contents becoming converted into spermatozooids; *h*, a single spermatozoid.
11. *Ophiocystium majus*, in different stages of development.
12. Spore-formation of *Vaucheria sessilis*. A, the sporangium *s*, and the antheridium *a*, not yet open; B, both open, the epoch of fertilization; C, decaying filament with ripe spore.
13. Fragment of a filament of *Edogonium tumidulum*, consisting of antheridial cells, one discharging a spermatozoid.
14. Fragment of *OE. ciliatum*, consisting of parent cells of androspores, one of which is escaping.
15. Fragment of *OE. gemelliparum*, male plant, consisting of antheridial cells, some bursting to discharge their twin spermatozooids.
16. Sporangium with sessile dwarf male plant of *OE. ciliatum*.
17. The same older, the dwarf male plant *a* having burst and discharged the spermatozoid which has entered the sporangial cell or oogonium.
18. Spermatozooids of *OE. ciliatum*.
19. A dwarf male plant of *OE. ciliatum*, discharging an androspore from its large basal cell.
20. Filament of *OE. Braunii*. *a*, *a*, dwarf male plants, sessile on the filament; *b*, *b*, fertilized spores in the sporangial cells.
21. Ripe spore of *OE. ciliatum*.
22. Gemmation of the resting-spore of *Bulbochæte intermedia*. *a*, ripe spore; *b*, the same enlarged; *c*, the contents dividing; *d*, the contents converted into four ciliated zoospores.



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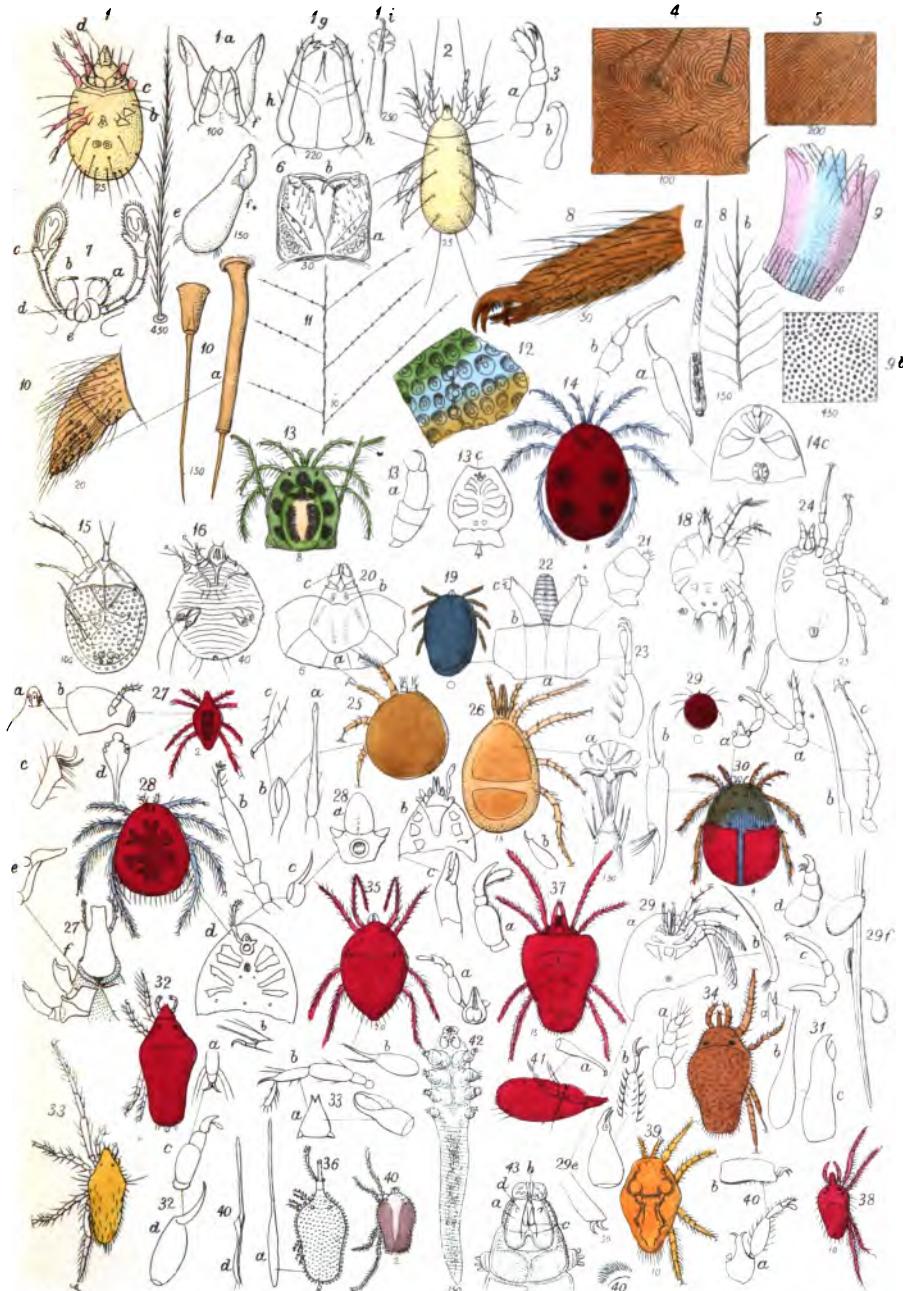
## PLATE 6.—Arachnida.

### Figure

1. *Acarus (Tyroglyphus) domesticus* (cheese-mite). *a*, labium and mandibles; *b*, hair; *g*, labium; *t*, end of leg.
2. *Acarus longior*.
3. *Anyotis ruricola*. *a*, palp; *b*, mandible of. (See Pl. 50. fig. 4.)
4. Epidermis of *Epeira diadema*. 5. Epidermis of a *Dermanyssus*.
6. Mandibles of *Epeira*.
7. Mandibles &c. of male *Tegenaria*. *a*, *b*, mandibles; *c*, palpi; *d*, maxillæ; *e*, labium.
8. End of leg of *Epeira*. *a*, *b*, hairs of the same.
9. Lung-plates of *Epeira*; *9 b*, piece more magnified.
10. Spinneret of *Tegenaria domestica*. *a*, two separate spinning-tubes, the right-hand one from *Epeira*, the left-hand one from *Tegenaria*.
11. Portion of cobweb of *Epeira*. 12. Epidermis of *Arrenurus*.
13. *Arrenurus viridis*, female, dorsal view. *a*, palp; *c*, under view of male, showing round mouth with hood and first two joints of palpi, the coxae, two stigmata and two granular plates, anal orifice and penis.
14. *Atax histrionicus*. *a*, mandible; *b*, palp; *c*, under view, with labium, coxae, and genital plates.
15. *Hippopus muscarum*. 16. *Sarcopetes scabiei*, under view, female.
18. *Peropotes equi*, under view. 19. *Ixodes Dugessi*, from above.
20. *Ixodes Dugessi*, anterior portion, from above. *a*, dorsal plate; *b*, basilar piece of support of rostrum; *c*, palpi, between which part of mandibles is visible.
21. *Ixodes Dugessi*, side view of palp.
22. *Ixodes Dugessi*, basilar piece from above. *a*, dotted lines indicating first joint of mandibles (*b*) seen through support; *c*, movable toothed claw.
23. *Ixodes Dugessi*, sixth and seventh joints of leg, with claws and caruncle.
24. *Dermanyssus avivum*, from beneath; *a*, labium of male, compressed, with palp (\*) and mandible (†); *b*, mandible of female; *c*, leg.
25. *Uropoda vegetans*. *a*, mandible; *b*, its end more magnified; *c*, sixth and seventh joint of leg in side view.
26. *Gamasus coleoptratorum*, from above. *a*, end of leg; *b*, body from beneath; *c*, mandible.
27. *Limnochares aquatica*. *a*, under view of labium and palpi; *b*, side view of labium; *c*, tarsus; *d*, scaly plate supporting eyes; *e*, two posterior coxae of one side only; *f*, rostrum protruded, with palpi and anterior coxae, trochanters and femora of one side only.
28. *Eylais extendens*. *a*, mouth with its hood, and first joint of palps; *b*, palp; *c*, end of mandible, with hook; *d*, under view of body, showing mouth, hood, and one palp, two groups of anterior coxae with intervening genital orifice and two stigmata, posterior coxae, anal orifice, and two other stigmata.
29. *Hydrachna globula*. *a*, under view, showing rostrum and palps, coxae, heart-shaped genital plate and anus; *b*, mandible; *c*, rostrum or labium, with a palp; *d*, palp of larva; *e*, end of leg; *f*, nymphs adherent to *Nepa*.
30. *Diplodontus escicularis*. *a*, labium with palp seen from beneath; *b*, mandible.
31. *Bdella longicornis*. *b*, mandible; *a*, end, more magnified; *c*, mandible of *Bd. cæruleipes*.
32. *Tetranychus glaber*. *a*, end of leg, front view, *b*, side view; *c*, palp; *d*, mandible.
33. *Megamerus celer*. *a*, labium; *b*, palp; *c*, mandible of *Megamerus roseus*.
34. *Pachynathus velutinus*. *a*, palp; *b*, end of leg; *c*, mandible.
35. *Tetranychus cristatus*, vel *lapidum*. *a*, labium of *Raphignathus ruberrimus* with palp and mandibles *in situ*; *b*, mandible of same.
36. *Smaris papillosa*, from above. *a*, mandible.
37. *Trombidium phalangi*. *a*, palpi; *b*, mandible.
38. *Trombidium (Leptus) autumnale*, from above. 39. *Pteroptus vespertilionis*, from above.
40. *Trombidium cinereum*. *a*, labium with a palp; *b*, tarsus; *c*, plume of the labium more magnified; *d*, a mandible.
42. *Demodex folliculorum*, from beneath.
43. *Demodex folliculorum*, anterior portion from above. *a*, palps; *b*, maxillæ; *c*, labrum; *d*, tubercles.
44. *Scirus (Bdella) elaphus*, side view. *a*, end of mandible.

ARACHNIDA.

Pl. 6.



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## PLATE 7.—Confervoides.

### Figure

1. *Chlorococcum vulgare*, Grev. *a*, groups in natural condition; *b*, an isolated cell showing the granular contents; *c*, dividing cells treated with sulphuric acid and iodine.
2. *Protococcus viridis*, nob. *a*, groups of cells, the upper one with eight in a linear series; those to the right with the contents dividing into numerous gonidia (?); *b*, zoospores set free from the cells by the solution of the cellulose membrane; *c*, an isolated cell dividing and about to set free its contents as two zoospores; *d*, resting-cells with a thick coat and reddish contents; *e*, a zoospore with the cilia cast off; *f*, a zoospore with imperfect or retracted cilia; *g*, remains of a zoospore left on a glass slide for twenty-four hours.
3. *Palmella cruenta*, Br. *a*, patch of the jelly with single cells, and dividing and divided pairs; *b*, similar cells without the gelatinous layer, the smaller granules similar to those seen in the jelly of *a*; *c*, cells treated with sulphuric acid and iodine, showing the cellulose coat and granular contents; *d*, diagram indicating the relative dimensions of the cells of *Palmella nivea*.
4. *Glaeocapsa polydermatica*, Ktz.
5. *a, b, c*, *Sarcina ventriculus*, Goodsir.
6. *Coccochloris Brebissonii*, Ktz. *a*, group of cells, some dividing within their cell-coat; *b*, a linear group; *c*, a pair of cells conjugating; *d*, conjugated cells encysted and passing into the resting stage.
7. *Urococcus Hookerianus*, Berk.
8. *a, b*, *Hydrurus Duchezii*, Ag.
9. *Botrydina vulgaris*, Ktz. *a, b, c, d*, successive stages of growth.
10. *Tetraspora gelatinosa*, Ag. Four parent cells producing biciliated zoospores, imbedded in the gelatinous frond.
11. *Gonium pectorale*, Müll. *a*, perfect frond; *b*, the same seen edgewise; *c*, a single zoospore.
12. *Gonium tranquillum*, Ehr.
13. *Glaeocapsa ampla*, Ktz.
14. *a, b*, *Volvox globator* (?), forms related to *Syncrypta* and *Eudorina* of Ehrenberg.
15. *Spirulina oscillarioides* (Turp. ?).
16. *Spirulina Jenneri*, Ktz.
17. *a*, *Bacterium termo*; *b*, *B. catenula*; *c*, *B. punctum*; *d*, *B. triloculare*; *e*, *B. lineola*; *f*, *Spirillum tenuie*; *g*, *Sp. undula*.
18. *Bacillus subtilis*.
19. *Vibrio rugula*.
20. *Bacillus ulna*.
- 20 *a*. *Vibrio serpens*.
21. *Vibrio bacillus*, probably *Anabaena subtilissima*, Kütz.
22. *Spirocheta plicatilis*.
23. *Spirillum volutans*.
- 24-36. *Volvox globator*, L.
24. A perfect family.
25. With fully developed young within.
26. With yellow encysted (resting) spores.
27. Portion of the outer wall, with zoospores, some dividing.
28. Ditto, showing the cilia of the zoospores.
29. Ditto, a fragment after keeping some time in chloride of calcium, the portions around each zoospore tumid.
30. The same seen obliquely, with the cilia.
31. Spore with the protoplasm dividing.
32. Ditto, more advanced.
33. An encysted spore with undivided contents.
34. An encysted resting-spore with yellow contents, probably a subsequent stage of 33.
35. Ditto, ruptured by pressure.
36. A similar resting-spore with conical processes on the outer coat (*V. stellatus*, Ehr.).



LORCH, 1911, Pl. 7.

G. Jerman Sc.





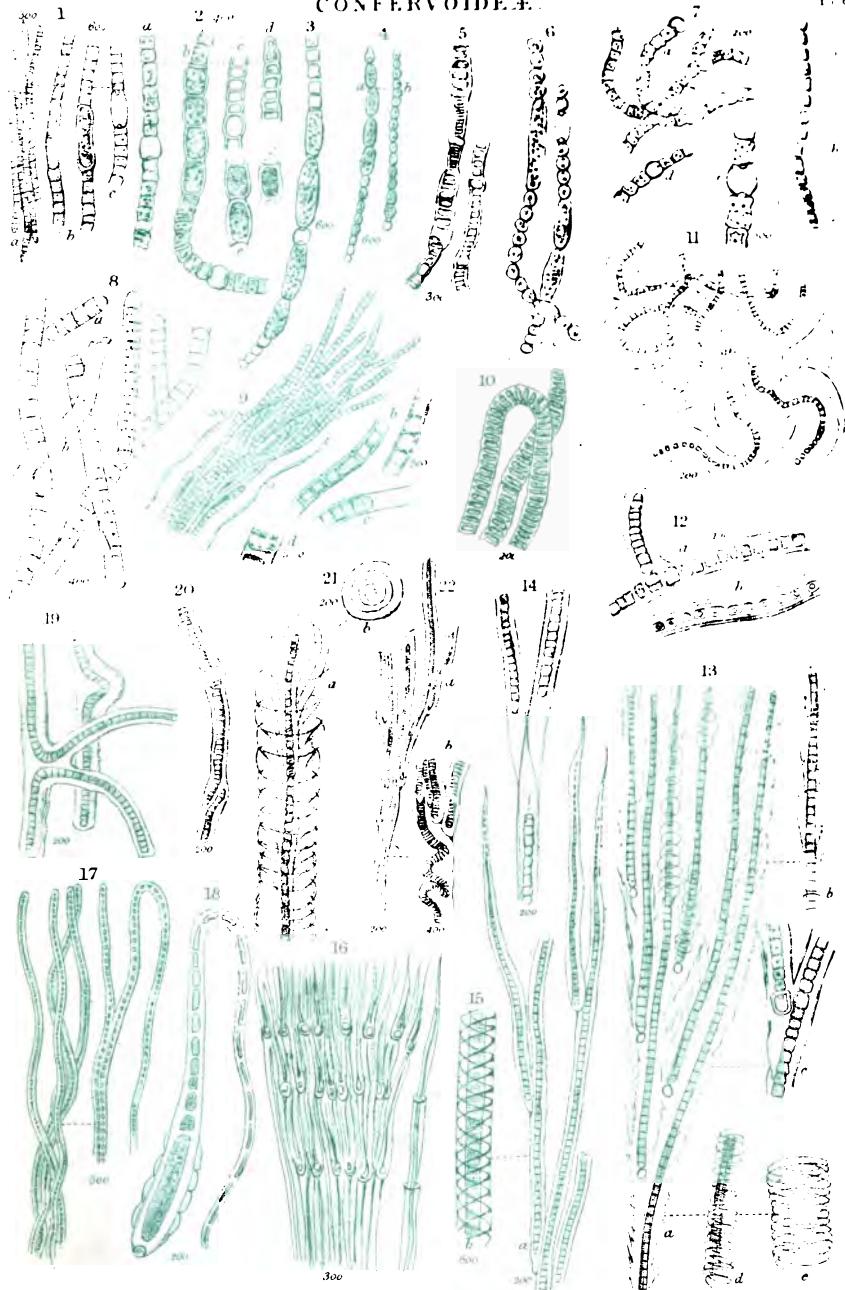
## PLATE 8.—*Confervoides.*

### Figure

1. *Aphanizomenon flos-aqua*, Morr. *a*, ordinary filaments; *b*, filaments with spermatic cells; *c*, filament with a vesicular cell (*heterocyst*).
2. *Trichormus mucicola*, n. sp. *a*, filament with vesicular cell; *b*, ditto with adjoining spermatic cells; *c* and *d*, fragments treated with acid to render the membrane and contents distinct; *e* and *f*, spermatic cells similarly treated.
3. *Sphaerozyga elastica*, Ag.
4. *Cylindroespermum catenatum*, Ralfs.
5. *Spermosira litorea*, Harv.
6. *Dolichospermum Ralfsii*, Thwaites.
7. *Nostoc commune*, Vauch. *a*, ordinary filaments; *b*, a single filament in its gelatinous sheath; *c* and *d*, fragments with a vesicular cell.
8. *Oscillatoria autumnalis*, Ag. *a*, fragments escaped from a sheath, *b*.
9. *Microcoleus repens*, Harv. ; *b*, fragments showing the single sheaths; *c*, *d*, fragments treated with sulphuric acid and iodine.
10. *Lyngbya muralis*, Ag.
11. *Dasygloea amorpha*, Berk.
12. *Sirospion ocellata*, Berk.
13. *Schizosiphon Warreniae*, Caspary. *a*, tuft of filaments; *b*, *c*, fragments; *d*, *e*, decomposing sheaths.
14. *Tolypothrix distorta*, Kütz.
15. *Ainactis calcarea*, Kütz. ; *b*, fragment showing the spiral sheath.
16. *Euactis atra*, Kütz.
17. *Schizothrix Creswellii*, Harv.
18. *Rivularia Boryana*, Kütz.
19. *Scytonema Myochrous*, Ag.
20. *Arthronema cirrhosum*, Hass.
21. *Petalonema alatum*, Berk. (*Arthrosiphon Grevillii*, Kütz.). *a*, end of a filament; *b*, cross section.
22. *Calothrix mirabilis*, Ag., *a*; *b*, junction of filaments.

CONFEROVIOIDEAE.

PL. 8



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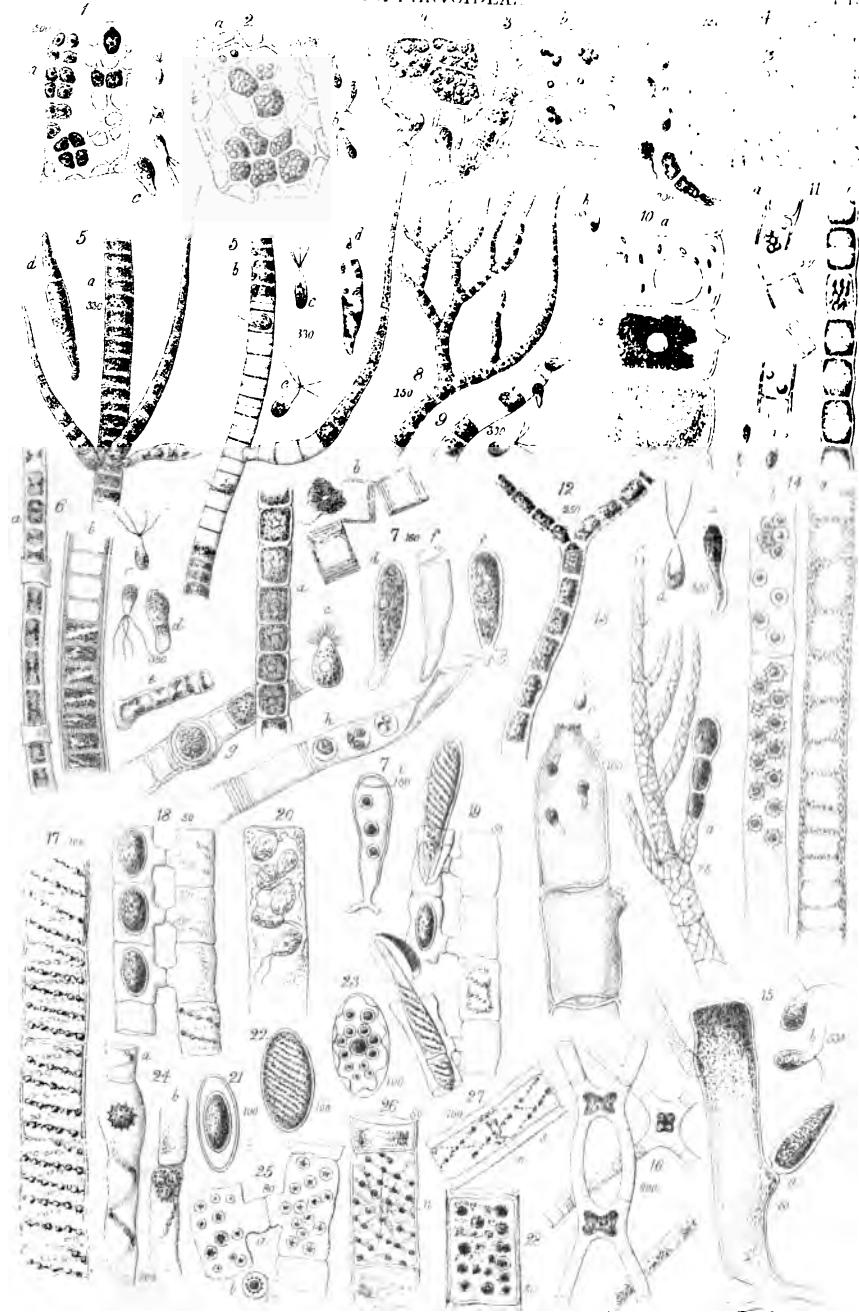
## PLATE 9.—Confervoides.

### Figure

1. *Monostroma bullosum*, Thuret. *a*, fragment of frond, with some cells empty; *b*, ciliated zoospores from the cells; *c*, zoospore germinating.
2. *Ulva Lactuca*, L. *a*, fragment of frond; *b*, small ciliated zoospores from ditto.
3. Ditto. *a*, fragment of frond; *b*, ditto, with the cells nearly empty, showing the orifices by which the zoospores escape; *c*, large zoospore; *d*, zoospores germinating.
4. *Enteromorpha clathrata*, Grev. *a*, fragment of frond; *b*, zoospores from ditto; *c*, the same in germination.
5. *Stigeoclonium protensum*, Kütz. *a* and *b*, fragments of branched filaments, *b*, emitting zoospores, *c*; *d*, germinating zoospores.
6. *Ulothrix mucosa*, Thur. *a*, *b*, fragments of filaments; *c*, zoospores; *d*, *e*, ditto germinating.
7. *Edogonium vesicatum*, Link. *a*, fragment of a filament; *b*, ditto, breaking up and emitting a zoospore; *c*, zoospore with a crown of cilia; *d*, *e*, germinating zoospores; *f*, membrane of a zoospore which has burst by a lid and discharged small zoospores immediately after germination; *g*, fragment of a filament with one cell containing a resting-spore; *h*, fragment of a filament in an abnormal state, containing globular bodies; *i*, germinating zoospore containing similar globular bodies.
8. *Chætophora elegans*, Ag.
9. A fragment of the same, emitting zoospores.
10. *Conferva aerea*, Dillw. *a*, fragment of filament, one cell of which has discharged its contents in the form of zoospores, *b*.
11. *Conferva floccosa*, Thur. *a*, filament breaking up; *b*, fragment of growing filament; *c*, zoospores.
12. *Rhizoclonium obtusangulum*, Kütz.
13. *Cladophora glomerata*, Kütz. *a*, filament with one fertile branch; *b*, apex of a fertile branch discharging zoospores, *c*.
14. *Sphaeroplea annulina*, Kütz. *a*, growing filament; *b*, filament with the contents converted into spores.
15. *Codium tomentosum*, Ag. *a*, apex of clavate branch, with fertile cell; *b*, zoospores.
16. *Stauroporus gracilis*, Hass.; conjugating filaments.
17. *Spirogyra quinina*, Kütz.; growing filament.
18. Conjugating filaments, with spores.
19. Ditto, with the spores germinating.
20. Half-decomposed cell, with the contents converted into almost colourless biciliated zoospores.
21. Spore formed after conjugation.
22. The same shortly before germination.
23. A similar spore, with the contents converted into globular bodies.
24. *a* and *b*, portions of a *Spirogyra*? with the contents converted into spiny globular bodies.
25. *Spirogyra quinina*, Kütz.; imperfectly conjugated cells, with the contents converted into globular bodies.
26. *Spirogyra nitida*; cell with nucleus, *n*.
27. *Spirogyra pellucida*, Kütz.; cell with nucleus, *n*, and gelatinous outer coat, *s*.
28. *Spirogyra nitida*, Kütz., half-decayed, the contents partly changed into globular masses.

## CONFEROIDEAE

FIG. 9







## PLATE 10.—*Confervoides*.—Crystals.

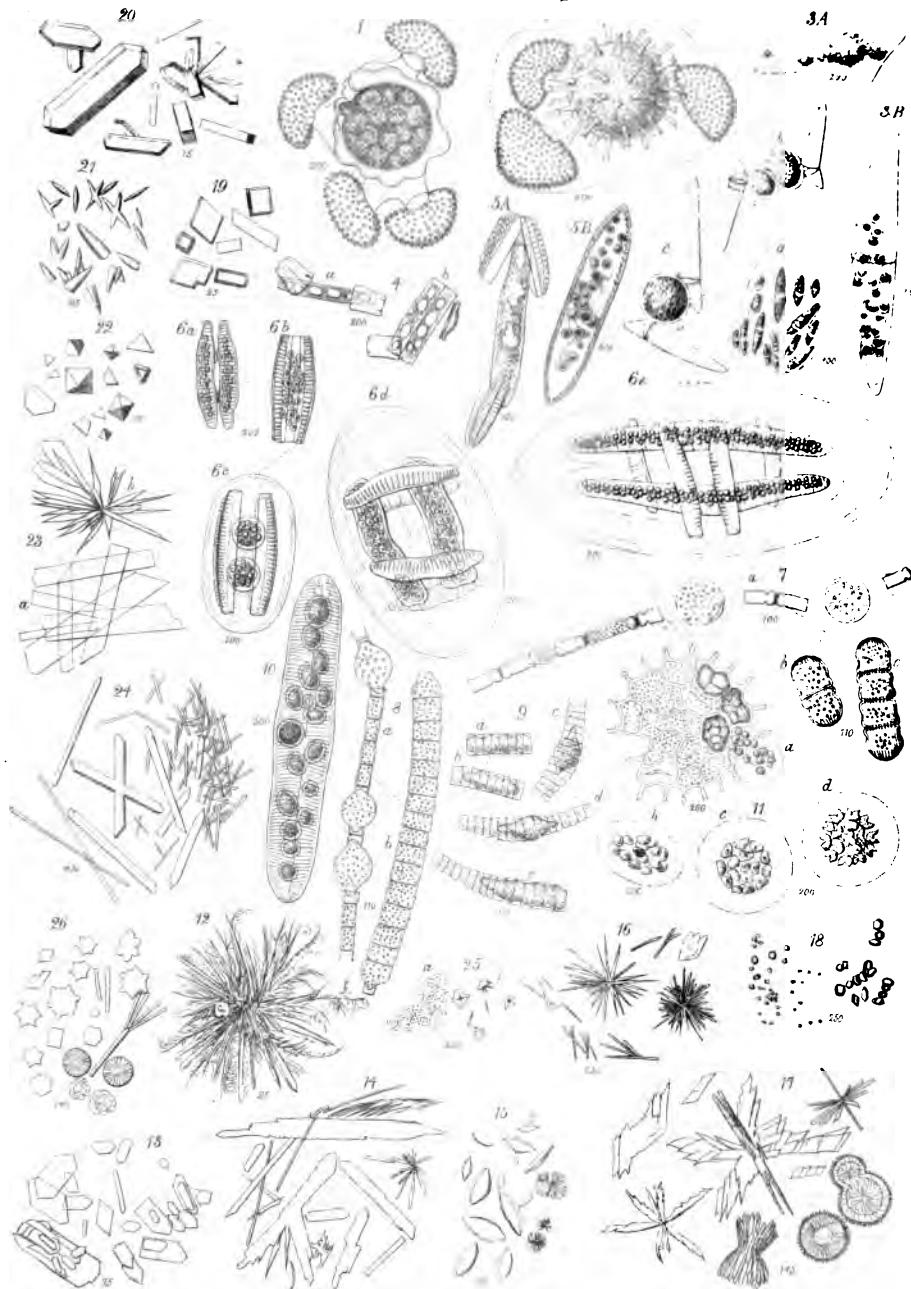
### Figure

1. *Cosmarium margaritiferum*, Turp.; conjugating pair with imperfect sporangia.
2. *Cosmarium botrytis*, Bory; conjugating pair with sporangia, enveloped in jelly.
- 3 A. *Closterium acerorum*, Schrank. *a*, *b*, *c*, different stages of conjugation; *d*, frustules apparently produced from a sporangium.
- 3 B. *Closterium lunula*, Müll.; the contents converted into globular bodies.
4. *Fragilaria pinniculata*, Lyngb. *a* and *b*, successive stages of conjugation.
- 5 A. *Surirella bifrons*, Ehr.; conjugating pair, with intermediate large sporangial frustule.
- 5 B. *Surirella bifrons*, Ehr., with the contents converted into globular bodies.
6. *Epithemia turgida*, Ehr. *a*, *b*, *c*, *d*, *e*, successive stages of conjugation producing pairs of sporangial frustules.
7. *Melosira (Aulacosira) crenulata*, Thw. *a*, filament with two conjugating pairs of cells and perfect sporangial frustules; *b* and *c*, large filaments produced by sporangial frustules.
8. *Melosira varians*, Ag. *a*, small filament producing sporangial frustules by conjugation; *b*, large filament developed from sporangial frustules.
9. *Orthosira Dickiei*, Thw. Successive stages of production of sporangial frustules after conjugation.
10. *Pinnularia viridis*, Sm., with the contents converted into globular bodies.
11. *Pediastrum granulatum*, Ktz. *a*, a frond with most of the cells empty, three full, and the contents of another swarming out as zoospores; *b*, *c*, *d*, swarm of zoospores producing a new frond.
12. Crystals of sugar of milk.
13. " diabetic sugar.
14. " indigo, sublimed.
15. " oxalate of soda.
16. " sulphate of lime.
17. " phosphate of lime.
18. " sulphate of strontia.
19. " nitrate of soda.
20. " allantoin.
21. " antimoniate of soda.
22. " protoxide of antimony.
23. " butyrate of baryta. *a*, rapidly, *b*, slowly formed.
24. " hydrofluosilicate of baryta.
25. " sulphate of baryta. *a*, precipitated from concentrated, *b*, from very dilute solution.
26. " carbonate of potash.

## CONFEROIDEÆ & CRYSTALS

Pl. 10

2



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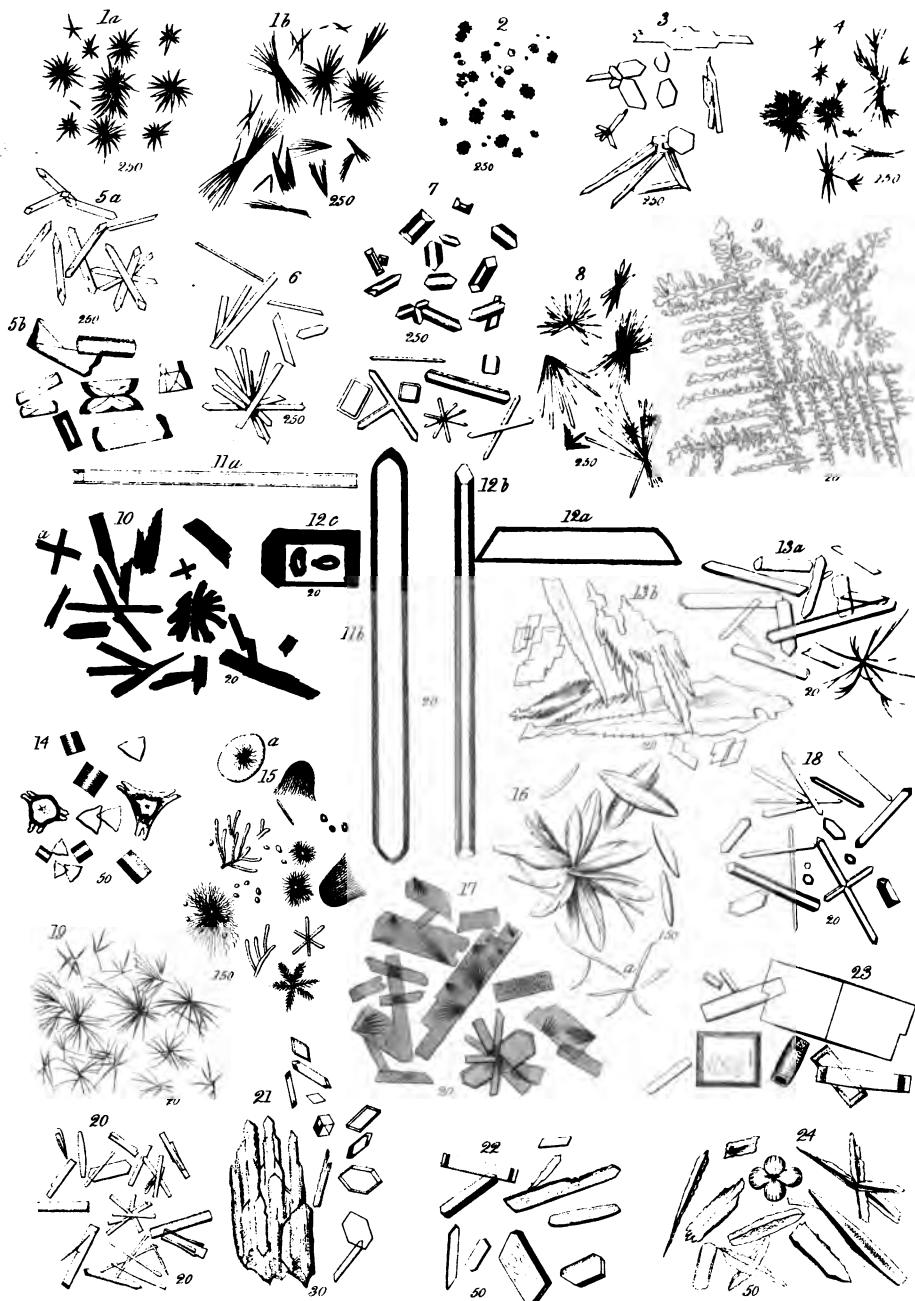
## PLATE 11.—Crystals.

### Figure

1. *a*, brucia; *b*, sulphocyanide of brucia.
2. Cinchonine.
3. Sulphocyanide of cinchonine.
4. Narcotine.
5. *a*, *b*, Strychnine.
6. Sulphocyanide of strychnine.
7. Morphia.
8. Sulphocyanide of quinine.
9. Muriate of ammonia.
10. Purpurate of ammonia (murexide).
11. } Nitrate of potash (ANALYTIC CRYSTALS).
12. }
13. Benzoic acid. *a*, crystallized from water; *b*, sublimed.
14. Lithofellinic acid.
15. Margarine.
16. Stearic acid; *a*, margaric acid.
17. Iodo-disulphate of quinine.
18. Hippuric acid.
19. Lactate of lime.
20. Lactate of zinc.
21. Succinic acid crystallized from water.
22. Creatine.
23. Creatinine.
24. Compound of creatinine and chloride of zinc.

CRYSTALS.

PL. 11







## PLATE 12.—Crystals from Animal Secretions.

### Figure

1. Uric acid, human, natural. *a*, rhombs, front view; *b*, side view; *c, d*, striated; *e*, rhombs with obtuse angles truncated; *f*, twin crystals; *g*, ditto; *h*, hour-glass crystals; *i*, nucleated ditto; *k, l, m, n, o*, aigrettes; *p*, large dumb-bell forms.
2. Uric acid, human, natural. *a*, front, *b*, side view.
3. Uric acid, coloured artificially by murexide.
4. Uric acid, natural. *a*, front, *b*, side view; *c*, aigrette.
5. Uric acid, precipitated from solution in sulphuric acid by water.
6. Uric acid, rhombs, slightly acted upon with potash, showing spurious nuclei.
7. Uric acid, precipitated from gout-stones.
8. Uric acid of *Boa*, artificially precipitated. *a—d*, from solution in sulphuric acid by water; *e—h*, from solution in potash by muriatic acid.
9. Uric acid, precipitated from the excrement of the tortoise.
10. Uric acid, precipitated:—*a*, from the excrement of the clothes-moth; *b*, from stag-beetle (*Lucanus cervus*).
11. Urate of soda and ammonia. *a*, spheres with nuclei and concentric rings, artificial; *b*, surface covered with radiating needles; *c, d, e*, natural forms; *f, g*, artificial.
12. Urates of soda and ammonia. *a*, artificial urate of ammonia, deposited on cooling of an aqueous solution; *b*, natural urate of soda, as composing the chalky matter around gouty joints.
13. *a, b*, Urate of lime.
14. *a, b*, Urate of magnesia.
15. Uric acid, precipitated by an acid from human urine.



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## PLATE 18.—Crystals from Animal Secretions.

### Figure

1. Various prismatic forms of the ammonio-phosphate of magnesia (triple phosphate), naturally formed in human secretions.
2. Feathery or penniform crystals of the same salt.
3. Stellate form of the same salt.
4. Minute imperfectly formed prisms of the same.
5. Cystic oxide.
6. Carbonate of lime deposited from water by standing.
7. Carbonate of lime from the urine of the horse, natural.
8. Carbonate of lime from the urine of man, natural.
9. Octahedra of oxalate of lime, as seen in water.
10. Octahedra of oxalate of lime, as seen when dried.
11. Ellipsoidal forms of oxalate of lime, natural.
12. Ellipsoidal constricted, or dumb-bell forms of the same, natural.
13. Crystals of oxalate of lime, prepared with acid.
14. Modified octahedra of the same salt, formed by double decomposition.
15. Crystals of bilifulvine, natural, human.
16. Crystals of hæmatoidine.
17. Crystals of urea.
18. Nitrate of urea; *a*, *b*, slowly, *c*, rapidly formed.
19. Oxalate of urea.
20. Uroglaucline.
21. Cholesterine.







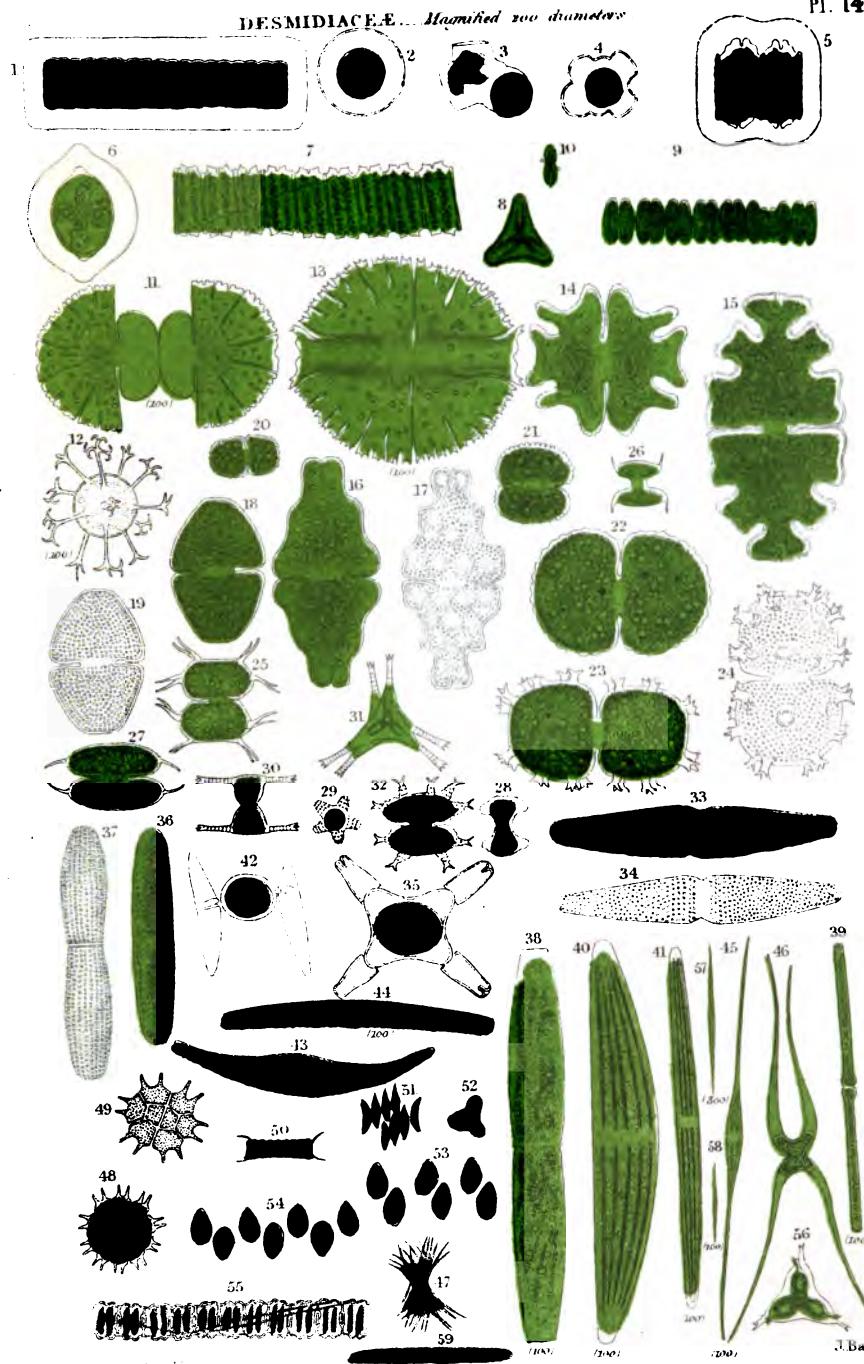
# PLATE 14.—Desmidiaceæ.

## Figure

1. *Hyalotheca dissimilis*, front view.
2. *Hyalotheca dissimilis*, side or end view.
3. *Hyalotheca dissimilis*, conjugating cells, with sporangia.
4. *Hyalotheca dissimilis*.
5. *Didymoprium Grevillei*, front view.
6. *Didymoprium Grevillei*, side view.
7. *Desmidium Swartzii*, front view.
8. *Desmidium Swartzii*, side view.
9. *Sphaerocystis vertebratum*, front view.
10. *Sphaerocystis vertebratum*, side view.
11. *Microasterias denticulata*, cell dividing.
12. *Microasterias denticulata*, sporangium.
13. *Microasterias rotata*.
14. *Euastrum verrucosum*.
15. *Euastrum oblongum*.
16. *Euastrum didelta*.
17. *Euastrum didelta*, cell free from contents.
18. *Coesmarium pyramidatum*.
19. *Coesmarium pyramidatum*, empty cell.
20. *Coesmarium crenatum*.
21. *Coesmarium margaritiferum*.
22. *Coesmarium tetraphthalium*.
23. *Xanthidium armatum*.
24. *Xanthidium armatum*, empty cell.
25. *Xanthidium fasciculatum*.
26. *Staurastrum dejunctum*.
27. *Arthrodeshmus convergens*.
28. *Staurastrum margaritaceum*, front view.
29. *Staurastrum margaritaceum*, side view.
30. *Staurastrum gracile*, front view.
31. *Staurastrum gracile*, side view.
32. *Didymocladon furcigerus*, front view; fig. 56, end view.
33. *Tetmemorus granulatus*.
34. *Tetmemorus granulatus*, empty cell.
35. *Tetmemorus laevis*, in conjugation.
36. *Penium Brebissonii*.
37. *Penium margaritaceum*, empty cell.
38. *Docidium truncatum*.
39. *Docidium baculum*.
40. *Cladophora lunula*.
41. *Cladophora acerosum*.
42. *Cladophora acerosum*, in conjugation.
43. *Cladophora moniliformis*.
44. *Cladophora didymotocum*.
45. *Cladophora setaceum*.
46. *Cladophora setaceum*, in conjugation.
47. *Ankistrodesmus falcatus*.
48. *Pediastrum Boryanum*.
49. *Pediastrum granulatum*, empty cell.
50. *Scenedesmus quadricauda*.
51. *Scenedesmus obliquus*.
52. *Aptogonium desmidium*, side view; fig. 55, front view.
53. *Scenedesmus obtusus*, just after division.
54. *Scenedesmus obtusus*, ordinary state.
55. *Aptogonium desmidium*, front view; fig. 52, side view.
56. *Didymocladon furcigerus*; a, end view; fig. 32, front view.
57. *Cladophora Griffithii*.
58. *Spirotaenia condensata*.

DESMIDIACEAE... Magnified 200 diameters

Pl. 14





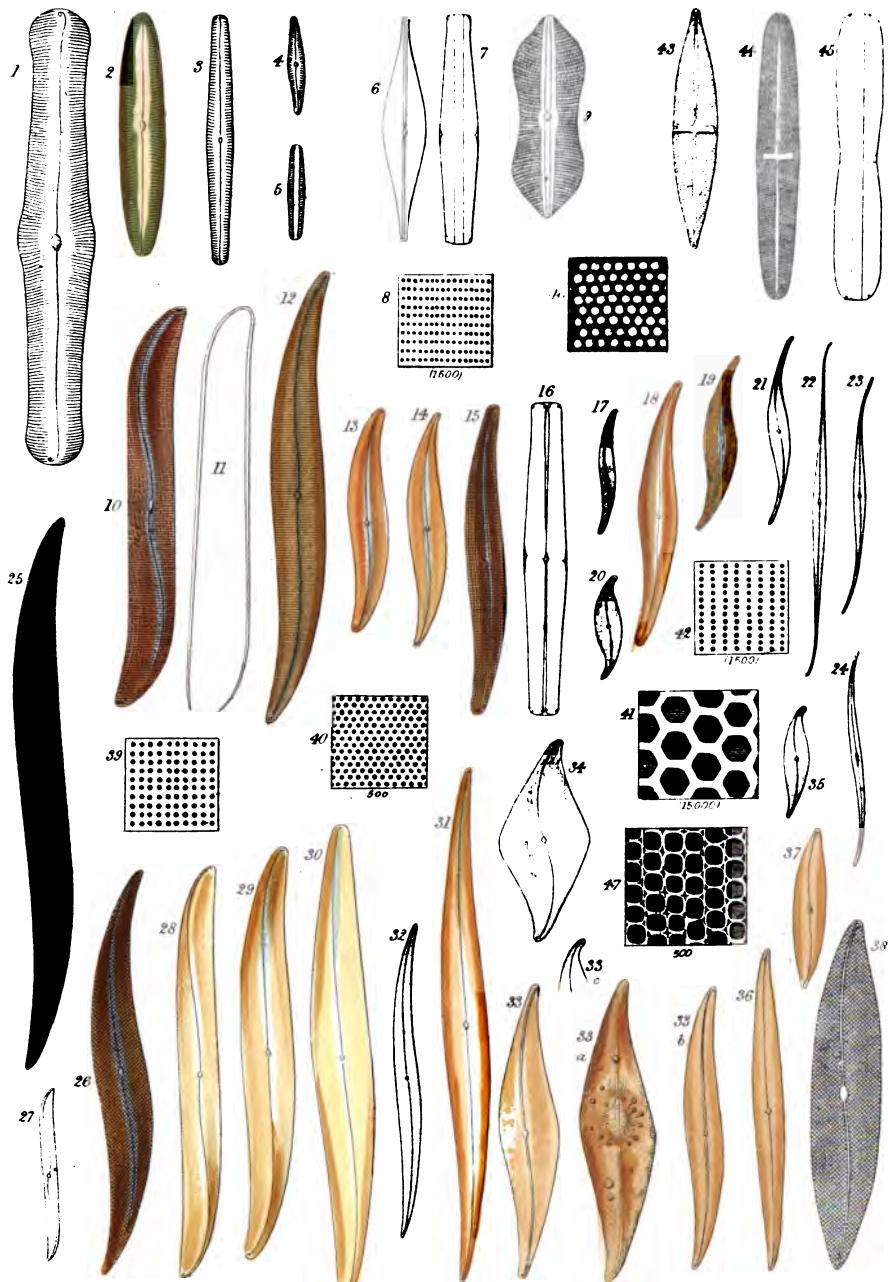


## PLATE 15.—Diatomaceæ.

The figures represent the prepared frustules or valves, except when otherwise stated.

### Figure

1. *Pinnularia nobilis*, side view.
2. *Pinnularia viridis*, side view, with endochrome.
3. *Pinnularia oblonga*, side view.
4. *Pinnularia radiosa*, side view.
5. *Pinnularia radiosa*, front view.
6. *Navicula cuspidata*, side view.
7. *Navicula cuspidata*, front view.
8. Portion of the valve of a *Navicula*, showing the transverse rows of dots.
9. *Navicula didyma*, side view.
10. *Pleurosigma balticum*, side view.
11. Hoop of the same, side view.
12. *Pleurosigma strigilis*, side view.
13. *Pleurosigma hippocampus*, side view.
14. *Pleurosigma acuminatum*, side view.
15. *Pleurosigma attenuatum*, side view.
16. *Pleurosigma attenuatum*, front view.
17. *Pleurosigma Spencerii*, side view.
18. *Pleurosigma lacustre*, side view.
19. *Pleurosigma littorale*, side view.
20. *Pleurosigma distortum*, side view.
21. *Pleurosigma fasciola*, side view.
22. *Pleurosigma macrum*, side view.
23. *Pleurosigma prolongatum*, side view.
24. *Pleurosigma tenuissimum*, side view.
25. *Pleurosigma formosum*, side view.
26. *Pleurosigma decorum*, side view.
27. *Pleurosigma obscurum*, side view.
28. *Pleurosigma speciosum*, side view.
29. *Pleurosigma strigosum*, side view.
30. *Pleurosigma rigidum*, side view.
31. *Pleurosigma elongatum*, side view.
32. *Pleurosigma delicatulum*, side view.
33. *Pleurosigma angulatum*, side view. *a*, with endochrome; *b*, variety  $\beta$ ; *c*, variety  $\gamma$ , end of.
34. *Pleurosigma quadratum*.
35. *Pleurosigma astuarii*.
36. *Pleurosigma intermedium*.
37. *Pleurosigma transversale*.
38. *Pleurosigma transversale*.
39. Portion of valve of *P. balticum*.
40. Portion of valve of *P. strigosum*.
41. Portion of valve of *P. angulatum* (DIATOMACEÆ).
42. Portion of valve of *P. littorale*.
43. *Stauroneis phoenicenteron*, side view.
44. *Stauroneis pulchella*, side view.
45. *Stauroneis pulchella*, front view.
46. *Pleurosigma angulatum*, showing the dots as pearls.
47. *Isthmia enervis*, portion of.



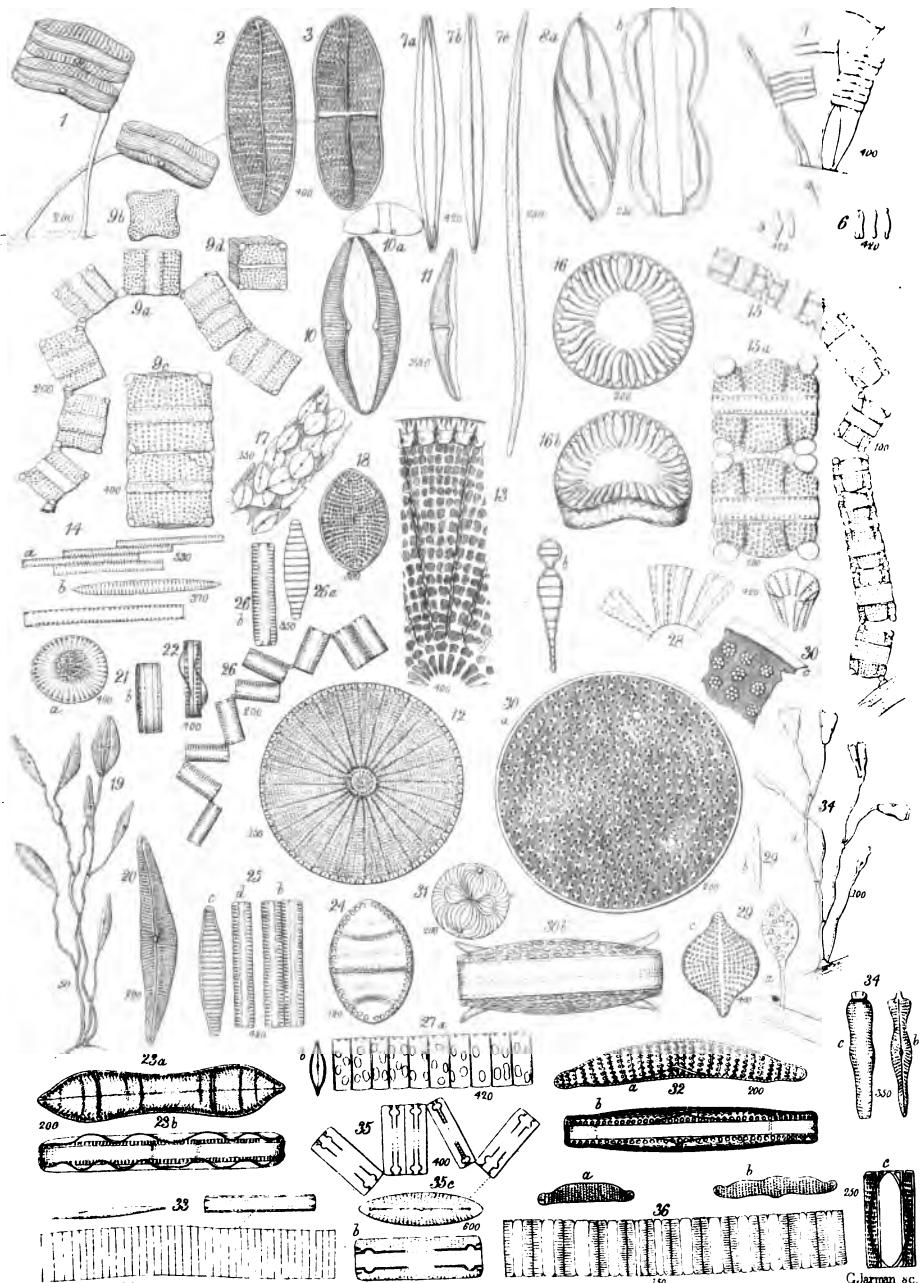




## PLATE 16.—Diatomaceæ.

### Figure

1. *Achnanthes longipes*; the front view of the frustules is visible.
2. *Achnanthes longipes*, side view, upper valve.
3. *Achnanthes longipes*, side view, lower valve.
4. *Achnanthes exilis*.
5. *Achnanthidium microcephalum*, side and front views.
6. *Achnanthidium flexellum*, front and side views.
7. *Amphipleura pellucida*. *a*, side view of frustule; *b*, single valve; *c*, *Amphipleura sigmaeidea*.
8. *Amphiprora alata*. *a*, side view; *b*, front view.
9. *Amphitetas antediluviana*. *a*, frustules united; *b*, side view; *c*, front view; *d*, perspective view.
10. *Amphora ovalis*, front view; 10 *a*, transverse section.
11. *Amphora membranacea*, front view of single valve.
12. *Arachnoidiscus Ehrenbergii*, side view.
13. *Arachnoidiscus Ehrenbergii*, portion of valve from the centre to the circumference.
14. *Bacillaria paradoxa*. *a*, front view of conjoined frustules; *b*, side view; *c*, front view of single frustule. See also Pl. 18. fig. 17.
15. *Biddulphia pulchella*, front view. *a*, frustule dividing, front view.
16. *Campylodiscus costatus*, side view. *b*, front view.
17. *Cocconeis pediculus*.
18. *Cocconeis scutellum*, single valve (side view).
19. *Cocconema lanceolatum*.
20. *Cocconema lanceolatum*, single valve (side view).
21. *Cyclotella operculata*. *a*, side view; *b*, front view.
22. *Cyclotella Kutzningiana*, front view.
23. *Cymatopleura solea*. *a*, side view; *b*, front view.
24. *Cymatopleura elliptica*, side view.
25. *Denticula obtusa*. *b*, front view; *c*, side view of single frustule; *d*, front view of the same.
26. *Diatoma vulgare*, connected frustules. *a*, side view; *b*, front view of single frustule.
27. *Diadesmis confervacea*. *a*, front view; *b*, side view.
28. *Meridion constrictum*. *a*, connected frustules forming a coil; *b*, front view of single frustule.
29. *Doryphora amphiceros*. *a*, side view of frustule with endochrome; *b*, front view; *c*, prepared single valve.
30. *Eupodiscus argus*. *a*, side view; *b*, front view; *c*, fragment, more highly magnified.
31. *Eupodiscus sculptus*, side view.
32. *Epithemia turgida*. *a*, side view; *b*, front view.
33. *Fragilaria capucina*; side view of frustule, front view of the same, and frustules united into a filament.
34. *Gomphonema acuminatum*. *a*, filiform stipes; *b*, side view, *c*, front view of frustule.
35. *Grammatophora marina*, connected frustules. *b*, single frustule, front view; *c*, side view.
36. *Himantidium pectinale*, united frustules, front view. *a*, side view of single frustule; *b*, side view of variety  $\beta$ ; *c*, sporangial frustule.



Taffern West. del.

[cont'd. John Van Voorst.]





## PLATE 17.—Diatomaceæ.

### Figure

1. *Hyalosira rectangula*, front view of connected frustules.
2. *Isthmia enervis*, front view.
3. *Liomophora splendida*. *a*, side view; *c*, front view of single frustule.
4. *Lithodesmium undulatum*. *a*, front view; *b*, side view.
5. *Melosira nummuloides*, front view.
6. *Melosira varians*, front view. *a*, side view.
7. *Meridion circulare*. *a*, frustules united into a coil, front view; *b*, side view of single frustule.
8. *Micromega parasiticum*, natural size. *b*, portion of a filament containing the frustules; *c*, side view, *d*, front view of a frustule.
9. *Nitzschia sigmoides*. *a*, side view; *b*, front view.
10. *Nitzschia lanceolata*. *a*, front view; *b*, separate valve; *c*, side view of frustule; *d*, portion of valve, showing the dots.
11. *Nitzschia longissima*. *a*, side view; *b*, front view.
12. *Nitzschia reversea*, front view of single valve.
13. *Nitzschia*. *a*, *tænia*; *b*, *acicularis*.
14. *Odontidium turgidulum*. *a*, frustules united, front view; *b*, single valve, side view.
15. *Orthosira Dickieii*. *a*, front view; *b*, side view.
16. *Pododiscus jamaicensis*. *a*, side view; *b*, front view.
17. *Podosphenia Ehrenbergii*. *a*, front view; *b*, side view of single frustule.
18. *Rhabdonema arcuatum*. *a*, united frustules, front view; *b*, side view of single frustule. See also Pl. 18. fig. 69.
19. *Rhipidophora paradoxa*. *b*, front view of single frustule; *c*, side view of the same.
20. *Striatella unipunctata*. *a*, front view; *b*, the same; *c*, side view.
21. *Surirella gemma*. *a*, side view; *b*, front view.
22. *Surirella bifrons*. *a*, front view; *b*, side view.
23. *Synedra radians*. *a*, attached frustules; *b*, side view of prepared frustule; *c*, front view of the same.
24. *Synedra fulgens*. *a*, side view; *b*, front view of a prepared frustule.
25. *Synedra capitata*, side view.
26. *Sphenosira catena*. *a*, united frustules, front view; *b*, side view of single frustule.
27. *Tabellaria flocculosa*. *a*, united frustules, front view; *b*, side view of single frustule.
28. *Tetra cyclus lacustris*, united frustules, front view; *a*, side view.
29. *Triceratium favus*. *a*, side view; *b*, front view.
30. *Tryblionella scutellum*, side view.
31. *Tryblionella gracilis*, front view.
32. *Tryblionella gracilis*, diagram of transverse section.

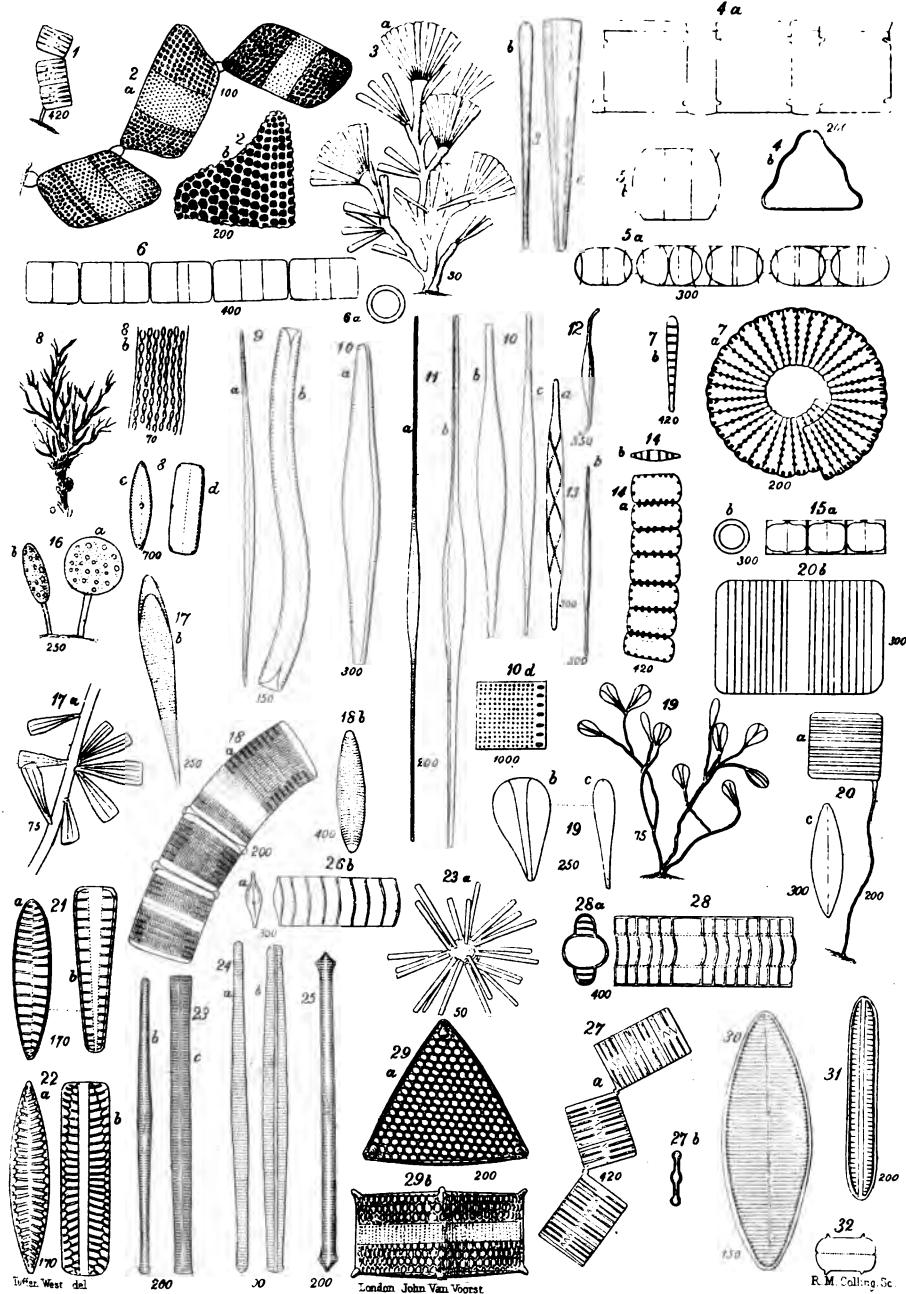






PLATE 18.—Diatomaceæ, etc.

Figure

1. *Actiniscus tetrasterias.*
2. *Actiniscus pentasterias.*
3. *Actiniscus quinarius.*
4. *Actiniscus discus.*
5. *Actiniscus rota.*
7. *Anaulus scalaris.*
8. *Actinogonium septenarium.*
9. *Arthrodesmus minutus.*
10. *Amaroucium proliferum* : a, nat. size ; b, individual body magnified (TUNICATA).
11. *Amphicampa eruca.*
12. *Amphicampa mirabilis.*
13. *Asellus vulgaris.*
14. *Asterionella formosa.*
15. *Asteromphalus Beaumontii.*
16. *Biddulphia rhombus.*
17. *Bacillaria paradoxa* (compare Pl. 16. fig. 14).
18. *Bacteriastrum curvatum.*
19. *Bowerbankia imbricata* : a, nat. size ; b, portion magnified ; c, single body.
20. *Botryllus polycyclus* : a, nat. size ; b, separate body (TUNICATA).
21. *Coscinodiscus (Craspedodiscus) pyxidula.*
22. *Gammarus pulex.*
23. *Mastogonia* : a, crux ; b, *actinoptychus.*
24. *Mastogonia prætexta.*
25. *Mastogonia hexagona.*
26. *Stephanodiscus Nagaræ.*
27. *Stephanodiscus lineatus.*
28. *Stephanodiscus sinensis.*
29. *Stephanodiscus Ægyptiacus.*
- 29\*. *Stephanodiscus Bramaputrae.*
30. *Stephanogonia polygona.*
31. *Hercotheca mammillaris.*
32. *Syringidium bicorne.*
33. *Syringidium palæmon.*

Figure

34. *Biblarium castellum.*
35. *Biblarium compressum.*
36. *Biblarium compressum.*
37. *Biblarium elegans.*
38. *Biblarium ellipticum.*
39. *Biblarium emarginatum.*
40. *Biblarium emarginatum.*
41. *Biblarium strumosum.*
42. *Biblarium stella.*
43. *Biblarium speciosum.*
44. *Biblarium rhombus.*
45. *Biblarium lineare.*
46. *Biblarium lancea.*
47. *Biblarium glans.*
48. *Biblarium follis.*
49. *Stylobibium clypeus.*
50. *Stylobibium* : a, b, *clypeus* ; c, *divisum* ; d, *eccentricum.*
51. *Halionyx undenarius.*
52. *Odontodiscus eccentricus.*
53. *Omphalopelta areolata.*
54. *Symbolophora acuta.*
55. *Symbolophora micrasterias.*
56. *Symbolophora pentas.*
57. *Systephania corona.*
58. *Systephania diadema.*
59. *Syndendrium diadema.*
60. *Auliscus pruinoeus.*
61. *Dicladia antennata.*
62. *Dicladia bulbosa.*
63. *Dicladia capreolus.*
64. *Dicladia capreolus.*
65. *Dicladia clathrata.*
66. *Periptera tetracladia.*
67. *Periptera capra.*
68. *Dictyolampra stella.*
69. *Rhabdonema arcuatum* ; compound frustule.

FOSSIL DIATOMACEÆ, &c.

Magnified 250-300 diameters, unless otherwise expressed

Pl 118.

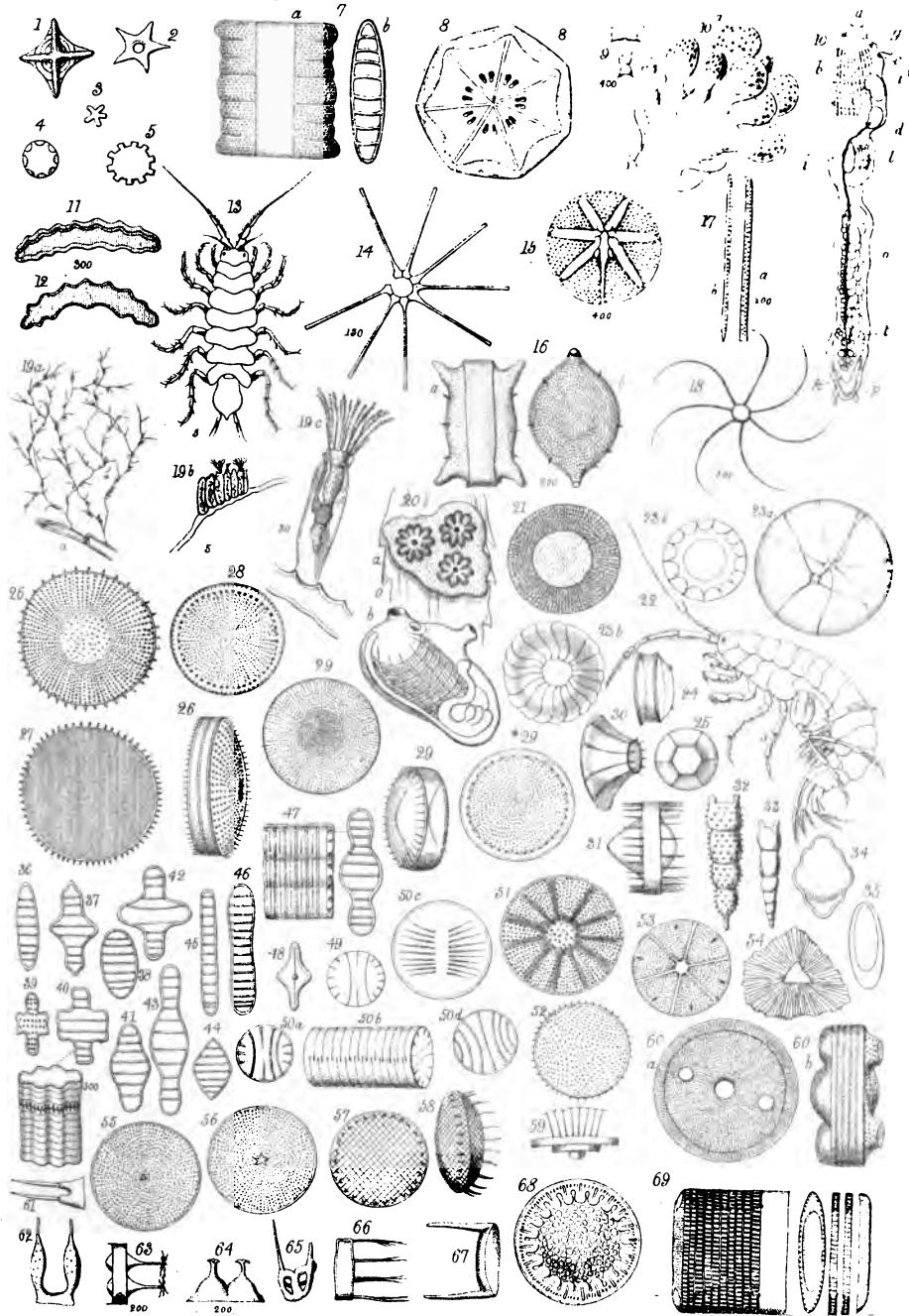






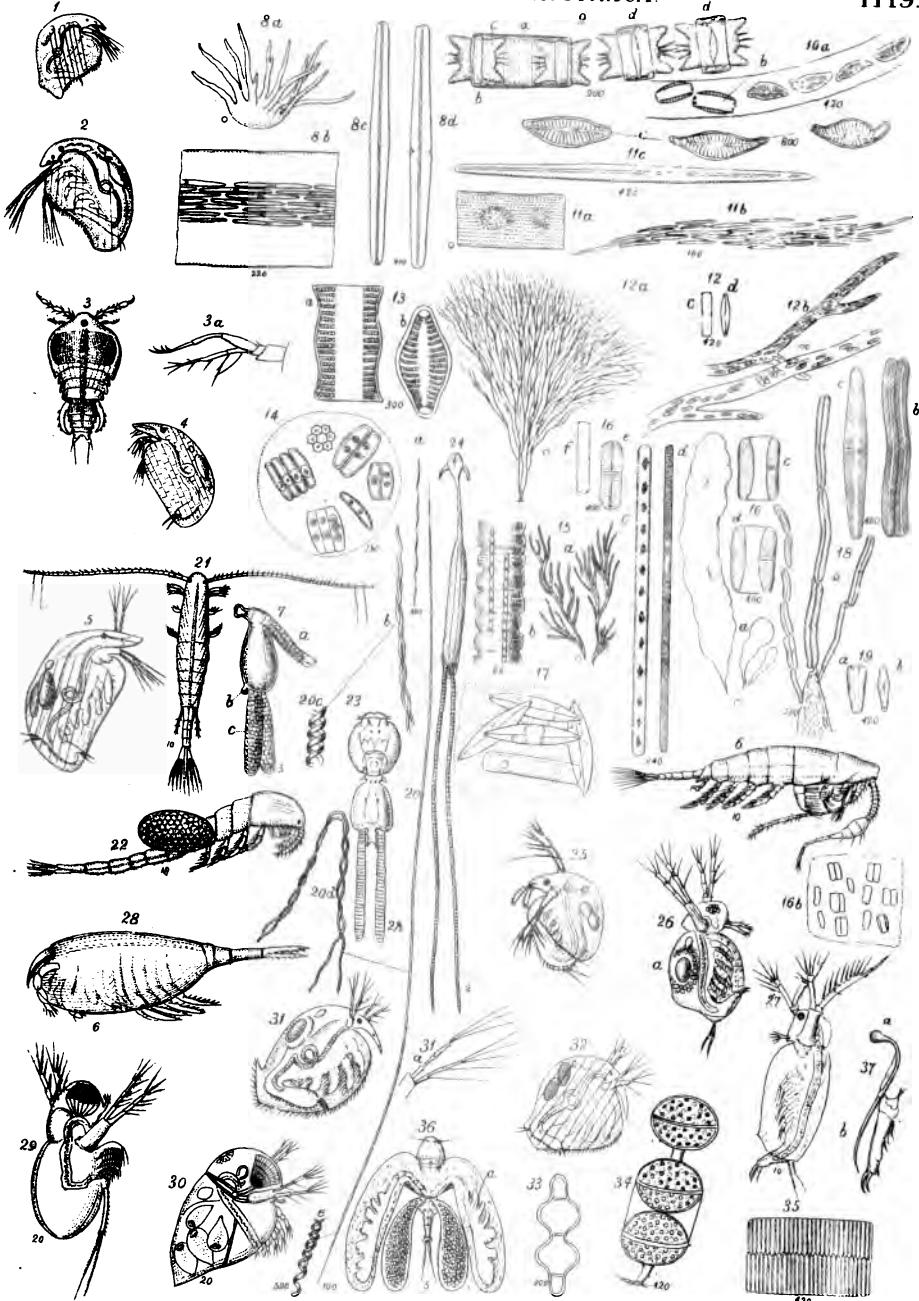
PLATE 19.—Diatomaceæ and Entomostraca.

Figure

1. *Acoperus nanus.*
2. *Acoperus harpa.*
3. *Alteutha depreesa.* *a*, first pair of legs.
4. *Alona reticulata.*
5. *Alona quadrangularis.*
6. *Anomalocera Patersonii*, male.
7. *Anchorella uncinata.* *a*, arms; *b*, abdomen; *c*, ovarian tubes.
8. *Berkeleya fragilis.* *a*, natural size; *b*, portion of a branch containing frustules; *c*, side view, *d*, front view of a single frustule.
9. *Biddulpha aurita.* Frustules undergoing division: *a*, hoop of original frustule, to which two new halves (*c*) have been formed; the hoop of the new frustules is seen at *b*; the hoop of the parent has separated from the two frustules *d d*, which are perfectly formed, each with its new hoop.
10. *Encyonema prostratum.* *a*, frustules contained in a gelatinous tube, side view; *b*, front view; *c*, separate frustules, side view.
11. *Rhaphidogloea micans.* *a*, natural size; *b*, group of frustules; *c*, single frustule, front view.
12. *Schizonema Dillwynii.* *a*, natural size; *b*, filaments containing frustules; *c*, front view, *d*, side view of frustule.
13. *Zygoceros rhombus.* *a*, front view; *b*, side view.
14. *Synyclia salpa*; frustules immersed in a gelatinous mass.
15. *Homoeocladia anglica.* *a*, portion of the natural size; *b*, part of a filament containing two frustules; *c*, front view, *d*, side view of a prepared frustule.
16. *Dickiea alvoides.* *a*, natural size; *b*, portion of frond containing frustules; *c*, *d*, *f*, prepared frustules, front view; *e*, side view.
17. *Frustulia saxonica*; frustules immersed in a gelatinous mass.
18. *Cymbosira Agardhii.* *a*, united frustules; *b*, front view, *c*, side view of prepared frustules.
19. *Sphenella vulgaris.* *a*, front view; *b*, side view.
20. Spermatozoa of a *Cypris*.
21. *Cetochilus septentrionalis*, dorsal view.
22. *Notodelphys ascidicola*, female.
23. *Lepeophtheirus pectoralis*, female.
24. *Lerneonema spratta*, female.
25. *Macrothrix laticornis*, female.
26. *Moina rectirostris*, female.
27. *Sida crystallina*.
28. *Nebalia bipes*.
29. *Polyphemus pediculus*.
30. *Evadne Nordmanni*.
31. *Peracantha truncata.* *a*, superior antenna.
32. *Pleuroxus trigonellus*.
33. *Terpsinoe musica*: front view, Pl. 25. fig. 10.
34. *Podosira hormoidea*, front view.
35. *Tessella interrupta*, front view.
36. *Nicothoe astaci.* *a*, ovaries.
37. *Cythere lutea*. Poison-gland, *a*, and urticating organ, *b*.

DIATOMACEÆ & ENTOMOSTRACA.

PI 19.



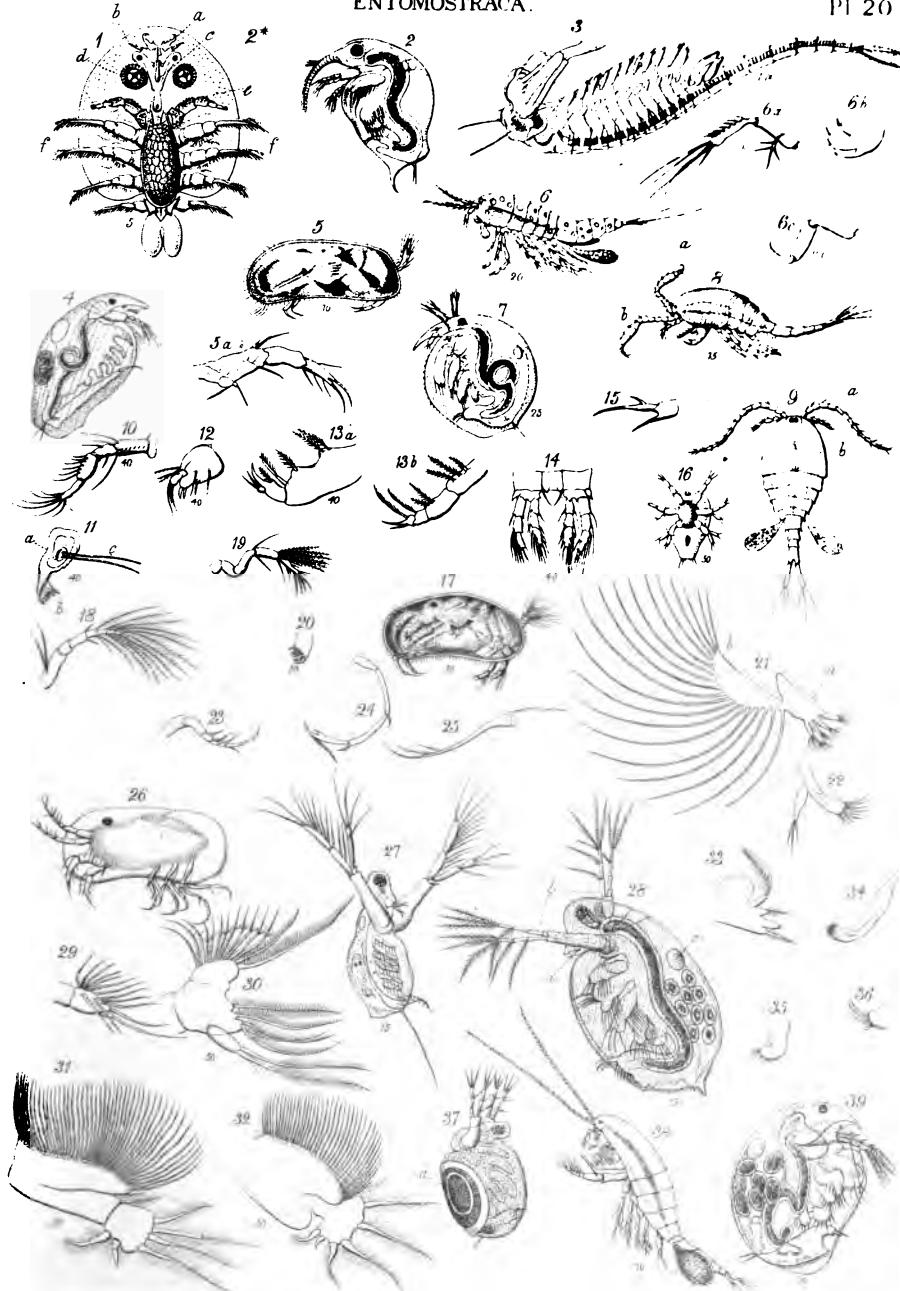




## PLATE 20.—Entomostraca.

### Figure

1. *Argulus foliaceus*, seen from beneath. *a*, anterior, *b*, posterior antennæ; *c*, rostrum; *d*, suckers, representing the first pair of legs; *e*, second pair of legs; *f*, four posterior pairs of legs.
2. *Boemina longirostris*; 2<sup>nd</sup>, the same, natural size.
3. *Branchipus stagnalis*.
4. *Campnocercus macrourus*.
5. *Cypris reptans*; 5 *a*, inferior antenna.
6. *Canthocamptus minutus*; 6*a*, inferior antenna; 6*b*, first pair of foot-jaws 6*c*, second pair of foot-jaws.
7. *Chydorus sphaericus*.
8. *Cyclops quadricornis*, male. *a, b*, superior antennæ
9. *Cyclops quadricornis*, female. *a*, superior, *b*, inferior antennæ.
10. *Cyclops quadricornis*, inferior antenna.
11. *Cyclops quadricornis*, mandible; *a*, body; *b*, serrated seta; *c*, filaments of palp.
12. *Cyclops quadricornis*, first pair of foot-jaws.
13. *Cyclops quadricornis*, second pair of foot-jaws: 13*a*, internal portion; 13*b*, external portion.
14. *Cyclops quadricornis*, first pair of thoracic legs.
15. *Cyclops quadricornis*, fifth pair of legs.
16. *Cyclops quadricornis*, recently hatched.
17. *Cypris tristriata*.
18. *Cypris tristriata*, superior antenna.
19. *Cypris tristriata*, inferior antenna.
20. *Cypris tristriata*, mandible.
21. *Cypris tristriata*, first pair of jaws; *a*, basal plate; *b*, branchial lamina.
22. *Cypris tristriata*, second pair of legs.
23. *Cypris tristriata*, first pair of legs.
24. *Cypris tristriata*, second pair of legs.
25. *Cypris tristriata*, lateral half of the abdomen.
26. *Cythere inopinata*.
27. *Daphnella Wingii*.
28. *Daphnia pulex*. *a*, superior antennæ; *b*, inferior antennæ; *c*, heart.
29. *Daphnia pulex*, first pair of legs.
30. *Daphnia pulex*, second pair of legs.
31. *Daphnia pulex*, third pair of legs.
32. *Daphnia pulex*, fourth pair of legs.
33. *Daphnia pulex*, fifth pair of legs.
34. *Daphnia pulex*, mandible.
35. *Daphnia pulex*, labrum.
36. *Daphnia pulex*, jaw.
37. *Daphnia reticulata*. *a*, ephippium.
38. *Diaptomus castor*.
39. *Eury cercus lamellatus*.



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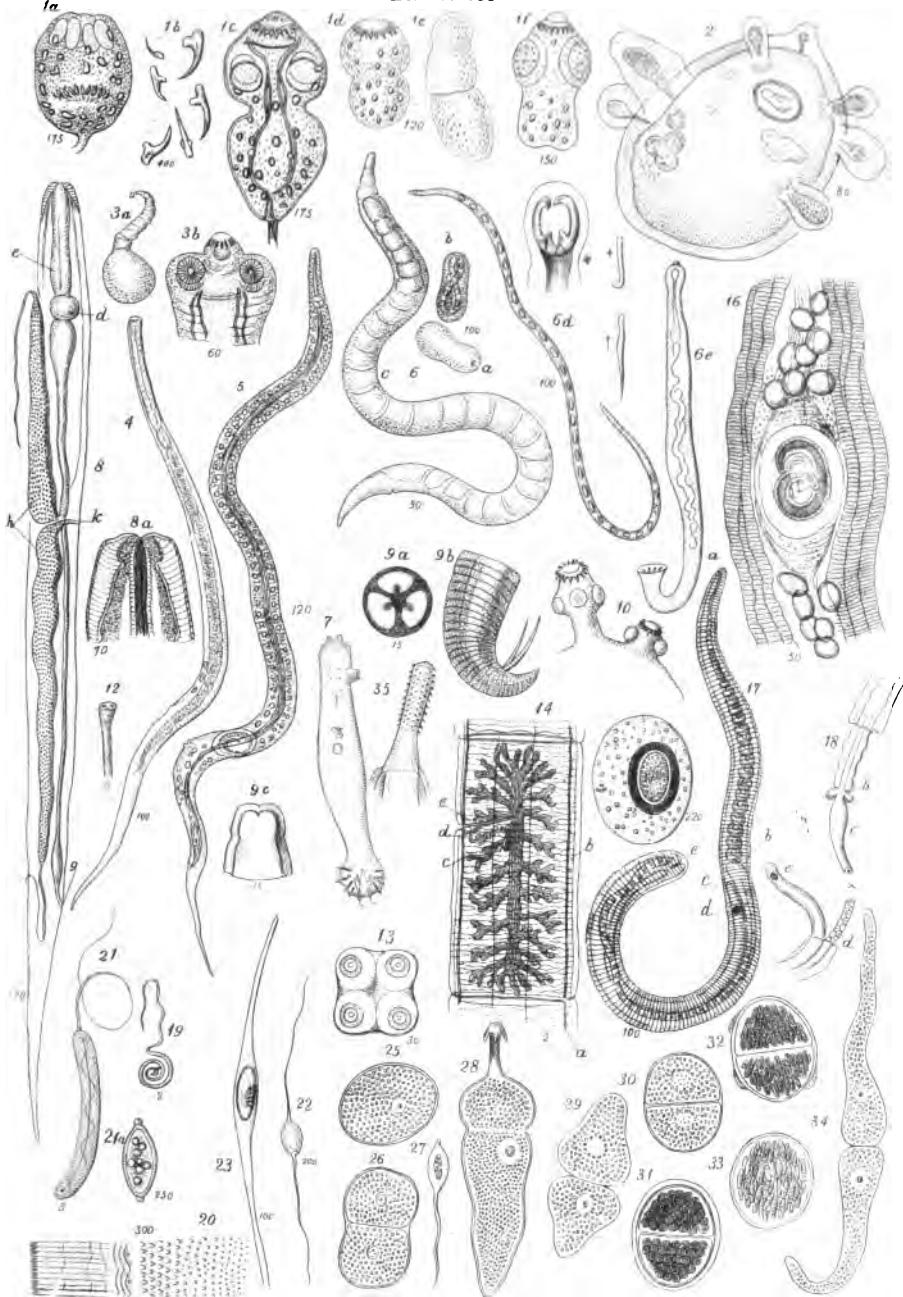




## PLATE 21.—*Entozoa.*

### Figure

1. *Echinococcus veterinorum (hominis)*; 1 a, in the contracted state; 1 b, hooks; 1 c, d, f, in the expanded state; 1 e, imperfectly developed individual.
2. *Echinococcus veterinorum (hominis)*, cyst reproducing by external gemmation.
3. *Cysticercus cellulosæ*, a, nat. size; 3 b, *C. fasciolaris*, head of.
4. *Anguillula fluvialis*.
5. *Anguillula aceti*.
6. *Anguillula tritici*. a, b, ova; c, mature individual; d, imperfectly developed individual.
- 6 e. *Dochmius (Anchylostomum) duodenalis*, male; \*, head of female; +, male, †, female, nat. size.
7. *Gyrodactylus auriculatus*, 8 diameters.
8. *Ascaris vermicularis*; 8 a, head; d, stomach; e, oesophagus; g, anus; h, ovaries; k, oviduct.
9. *Ascaris lumbricoides*; a, front view of head; 9 b, tail of male, with spicula; 9 c, side view of head.
10. *Cænurus cerebralis*, portion of a cyst,
12. *Tænia solium*, head of, side view; two of the suckers only are visible.
13. *Tænia solium*, head of, front view; all the four suckers are visible.
14. *Tænia solium*, a single joint, injected. a, gastric (?) canals; b, vascular canals; c, testicular capsule; d, spermatic duct; e, oviduct; the dark ramified organ is the ovary.
15. *Tænia solium*, ovum of.
16. *Trichina spiralis*, lying within its cyst, imbedded in muscle.
17. *Trichina spiralis*, removed from its cyst.
18. *Trichina spiralis*, internal organs.
19. *Trichocephalus dispar*, male.
20. *Trichocephalus dispar*, portion of the neck.
21. *Trichocephalus dispar*, female; 21 a, ovum.
22. *Monostoma verrucosum*, ovum of.
23. *Tænia variabilis*, ovum of.
25. *Gregarina sipunculi*.
26. *Gregarina sipunculi*, with two enclosed cells.
27. Caudate pseudo-navicula, from the abdominal cavity of *Sipunculus nudus*.
28. *Gregarina Sieboldii*.
29. Young pseudo-navicula cyst of *Gregarina sénuridis*, from testis of *Sænuris variegata*, consisting of loosely connected ovate cells, without an outer envelope.
30. The same, with an outer envelope.
31. More advanced pseudo-navicula cyst of the same *Gregarina*, with two cells containing rounded pseudo-naviculae.
32. The same, with elongated pseudo-naviculae; the cyst has three cell-like bodies on its surface.
33. The same with a single cavity, containing elongated pseudo-naviculae.
34. Two *Gregarinæ sénuridis*, adherent by their ends.
35. *Echinorhynchus anthuris*, head, 25 diameters.







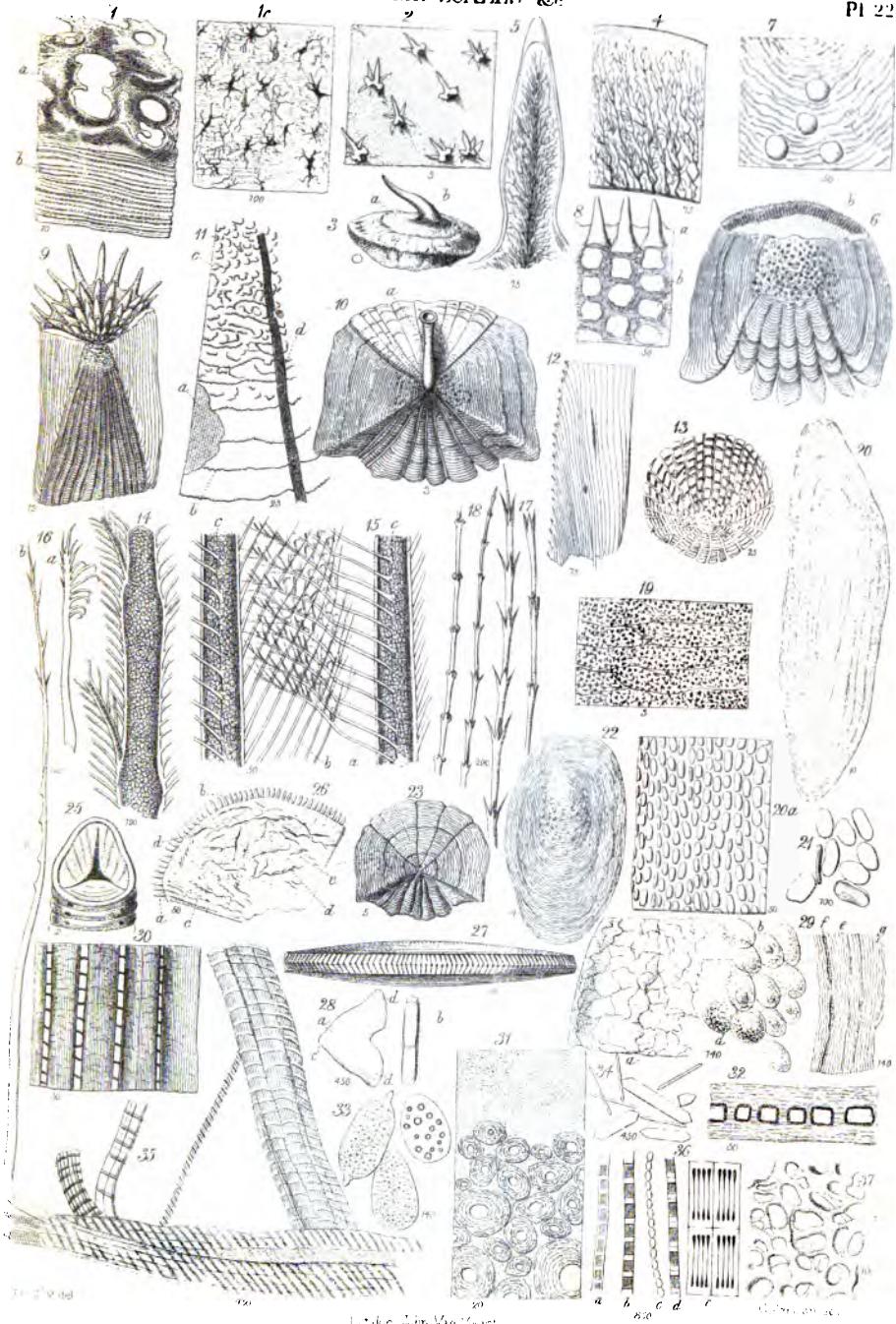
## PLATE 22.—Fish-scales, etc.

### Figure

1. Scale of sturgeon, perpendicular section. *a*, outer spongy portion ; *b*, inner laminated portion ; *1 c*, transverse section of outer portion.
2. Skin of thornback skate (*Raia clavata*), viewed from above.
3. Large spine of skate, side view.
4. Portion of transverse section of large spine of skate (fig. 3 *b*).
5. Longitudinal section of tooth of a small spine of skate (fig. 2).
6. Scale of perch (*Perca fluviatilis*).
7. Perch-scale, portion of (fig. 6 *a*), more magnified.
8. Perch-scale, portion of (fig. 6 *b*), more magnified.
9. Scale of sole (*Solea vulgaris*).
10. Scale of roach (*Leuciscus rutilus*).
11. Scale of roach (*Leuciscus rutilus*), portion of surface more highly magnified.
12. Scale of roach (*Leuciscus rutilus*), perpendicular section.
13. Scale of minnow (*Leuciscus phoxinus*).
14. Feather of finch ; shaft with medullary cells.
15. Feather of goose (*Anser cinereus*). *a*, pinnæ with hooks ; *b*, pinnæ with teeth ; *c*, barbs.
16. Separate pinnæ. *a*, with hooks ; *b*, with teeth.
17. } Feather (downy), free barbs of.
18. }
19. Skin of eel (*Anguilla vulgaris*), with stellate pigment-cells, and indications of subjacent scales.
20. Scale of eel (*Anguilla vulgaris*). 20 *a*, portion, more magnified.
21. Calcareous corpuscles from the same, left after red heat.
22. Scale of jack or pike (*Esox lucius*).
23. Scale of dace (*Leuciscus vulgaris*).
25. Leech (*Hirudo medicinalis*), anterior sucker of.
26. Leech, jaw of, side view. *a*, *b*, teeth ; *c*, fibro-cartilaginous substance of jaw ; *d*, pigment-cells.
27. Leech, jaw of, the free margin turned towards the observer.
28. Leech, teeth of. *a*, side view ; *b*, front view.
29. Horn of cow. *a*, section parallel to surface ; *b*, cells softened by potash ; *d*, containing pigment ; *e*, perpendicular section ; *f*, cracks between laminæ ; *g*, edges of divided laminæ.
30. Whalebone, longitudinal section.
31. Whalebone, transverse section.
32. Whalebone, longitudinal section of hair of.
33. Whalebone, cells of, resolved by potash.
34. Fish, crystals from scales of.
35. Muscular fibres of lobster (*Astacus marinus*).
36. Muscular fibrillæ, various appearances presented by (p. 525).
37. Large spine of skate, outer portion of.

## FISH SCALES &c

Pl 22



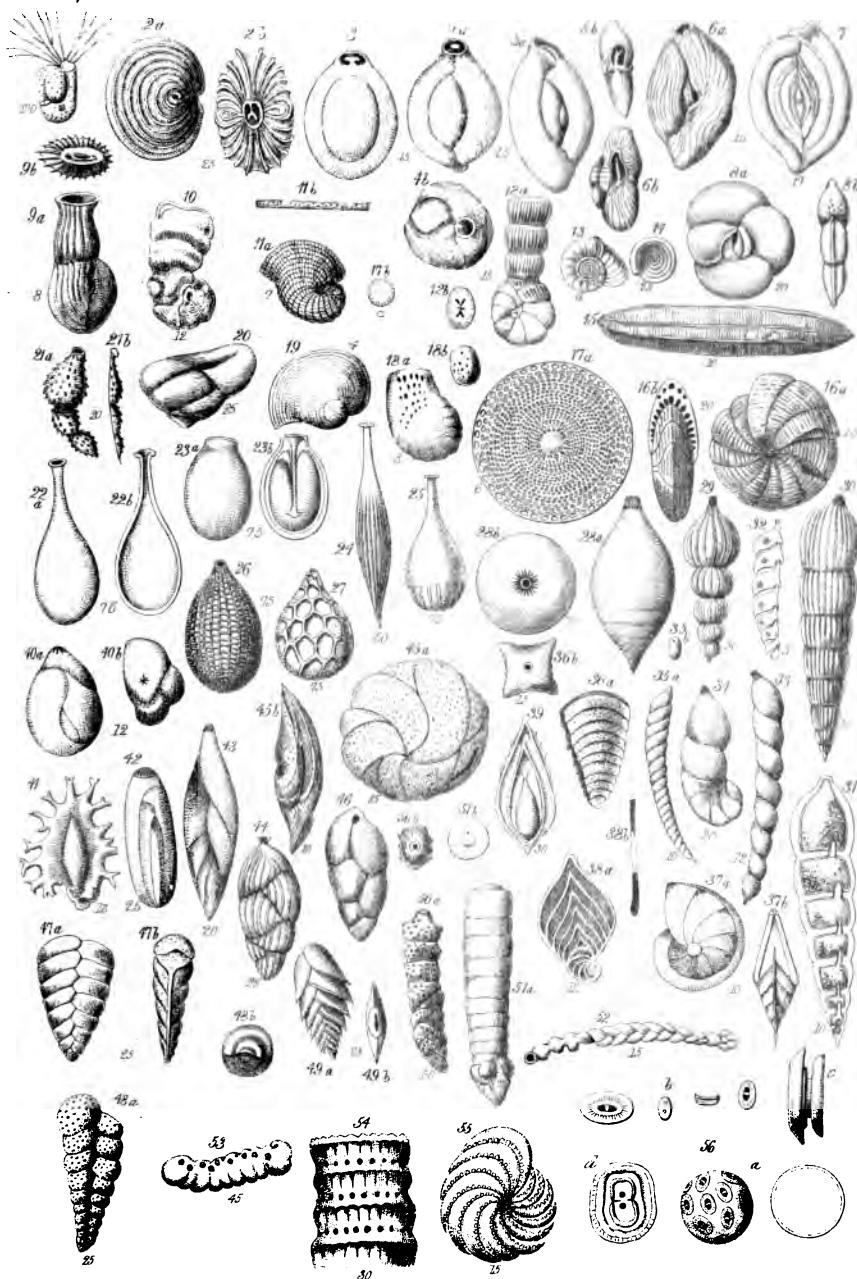




## PLATE 23.—Foraminifera, etc.

### Figure

1. *Miliola obesa* (young or "Adelosine" condition).
2. *Uniloculina indica*. *a*, side view; *b*, end view.
3. *Biloculina ringens*.
- 4 *a, b*. *Triloculina trigonula*.
5. *Quinqueloculina seminulum*, *a, b*.
- 6 *a, b*. *Quinqueloculina Brongniartii*.
7. *Spiroloculina planulata*.
8. *Hauerina compressa*, *a, b*.
9. *Articulina gibberula*, *a, b*.
10. *Vertebralina striata*.
11. *Peneroplis pertusus*, *a, b*.
12. *Spirolina austriaca*, *a, b*.
13. *Cornuspira foliacea*, magn. 8 diameters.
14. *Trochammina incerta*, magn. 25 diameters.
15. *Alveolina fusiformis*.
16. *Alveolina rotella*, *a, b*.
17. *Orbitolites complanatus*, *a, b*. *b*, natural size.
18. *Lituola difformis*, side view, somewhat abraded.
19. *Orbiculina adunca*.
20. *Valvulina austriaca*.
21. *Nubecularia rugosa*, *a, b*.
22. *Lagena levigata*; *b*, transverse section.
23. *Entosolenia globosa*, *a, b*.
24. *Lagena striata* (apiculate).
25. *Lagena semistriata*.
26. *Lagena squamosa*.
27. *Lagena scalariformis*.
28. *Glandulina levigata*, *a, b*.
29. *Nodosaria raphanus*, var.
30. *Marginulina raphanus*.
31. *Marginulina raphanus* (inside of the shell).
32. *Marginulina raphanus* (sarcocoe, without the shell).
33. *Dentalina communis*.
34. *Cristellaria simplex*.
35. *Vaginula badenensis*, *a, b*.
36. *Orthocerina quadrilatera*, *a, b*.
37. *Cristellaria culturata*, *a, b*.
38. *Flabellina rugosa*, *a, b*.
39. *Frondicularia spathulata* (fragment).
40. *Polymorphina communis*, *a, b*.
41. *Polymorphina Orbignyi* (*tubulosa*).
42. *Polymorphina oblonga*.
43. *Polymorphina compressa*.
44. *Uvigerina pygmaea*.
45. *Cassidulina levigata*, *a, b*.
46. *Bulimina pupoides*.
47. *Textularia cuneiformis*, *a, b*.
48. *Gaudryina pupoides*, *a, b*.
49. *Vulvulina gramen*, *a, b*.
50. *Bigenlerina agglutinans*, *a, b*.
51. *Clavulina* (*Valvulina*) *parisiensis*, *a, b*.
52. *Textularia annexens*.
53. *Dactylopora eruca*.
54. *Dactylopora reticulata*.
55. *Polystomella crispa*, the body (sarcocoe) of.
56. *Coccospores*, *a*; *coccoliths*, *b, c, d*; highly magnified.



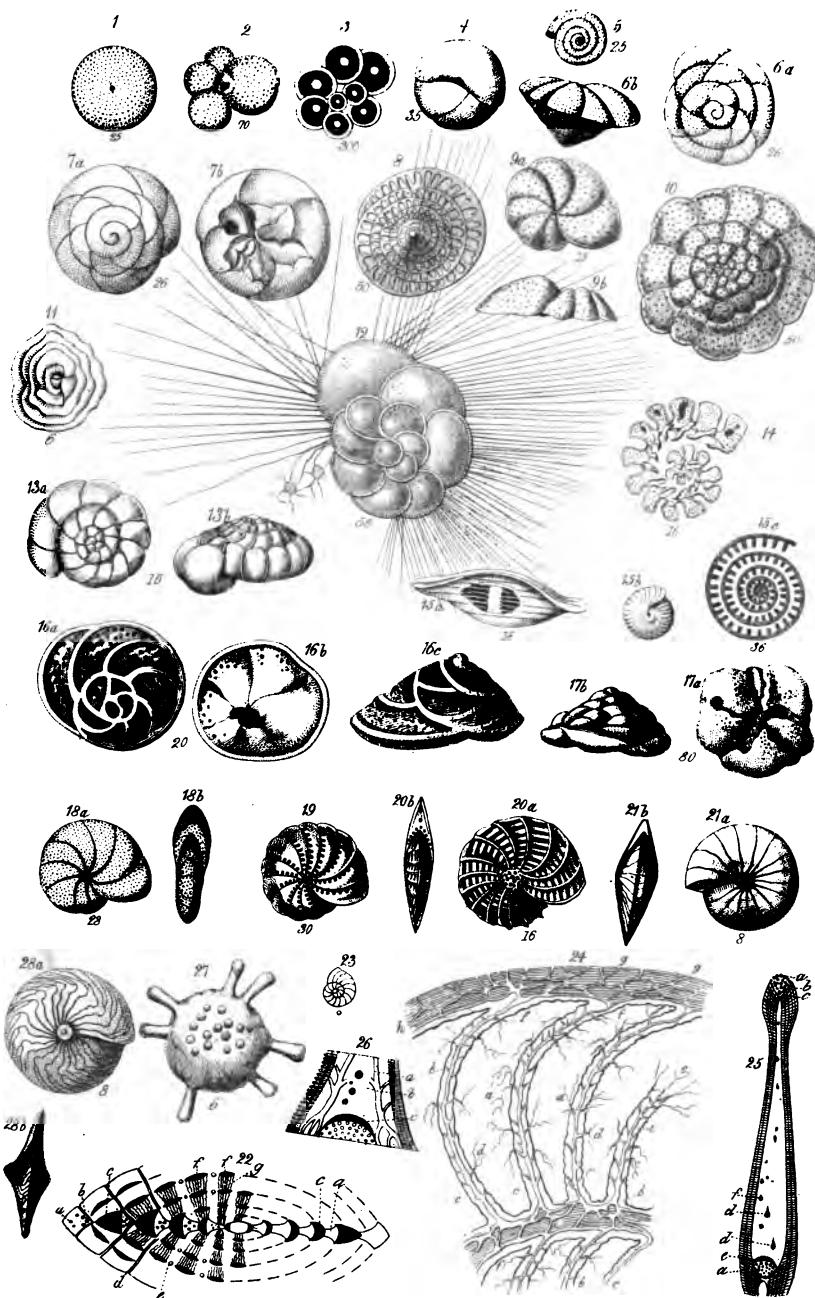




## PLATE 24.—Foraminifera.

### Figure

1. *Orbulina universa*.
2. *Globigerina bulloides*.
3. Ditto, seen by transmitted light, with air in the cells.
4. *Sphaeroidina austriaca*.
5. *Spirillina perforata*.
6. *Planorbulina Haidingeri*, a, b.
7. *Discorbina rosacea*, a, b.
8. *Patellina corrugata*.
9. *Truncatulina lobatula*, a, b.
10. *Planorbulina mediterranensis*.
11. *Pulvinulina vermicularis*.
12. *Planorbulina veneta* (living).
13. *Rotalia Beccarii*, a, b.
14. Ditto ; sarcodite, without shell.
15. *Fusulina cylindrica*, a, b, c.
16. *Pulvinulina repanda*, a, b, c.
17. *Cymbalopora Poyei*, a, b.
18. *Nonionina crassula*, a, b.
19. *Polystomella striato-punctata*.
20. *Polystomella crispa*, a, b.
21. *Nummulites radiata*, a, b.
22. *Nummulites acuta*, section.
23. *Operculina arabica*, nat. size.
24. Ditto, enlarged horizontal section of portion.
25. Ditto, enlarged transverse section of part. } (FORAMINIFERA).
26. Ditto, portion of fig. 25, highly magnified. }
27. *Calcarina Spengleri*.
28. *Amphistegina Hauerina*, a, b.



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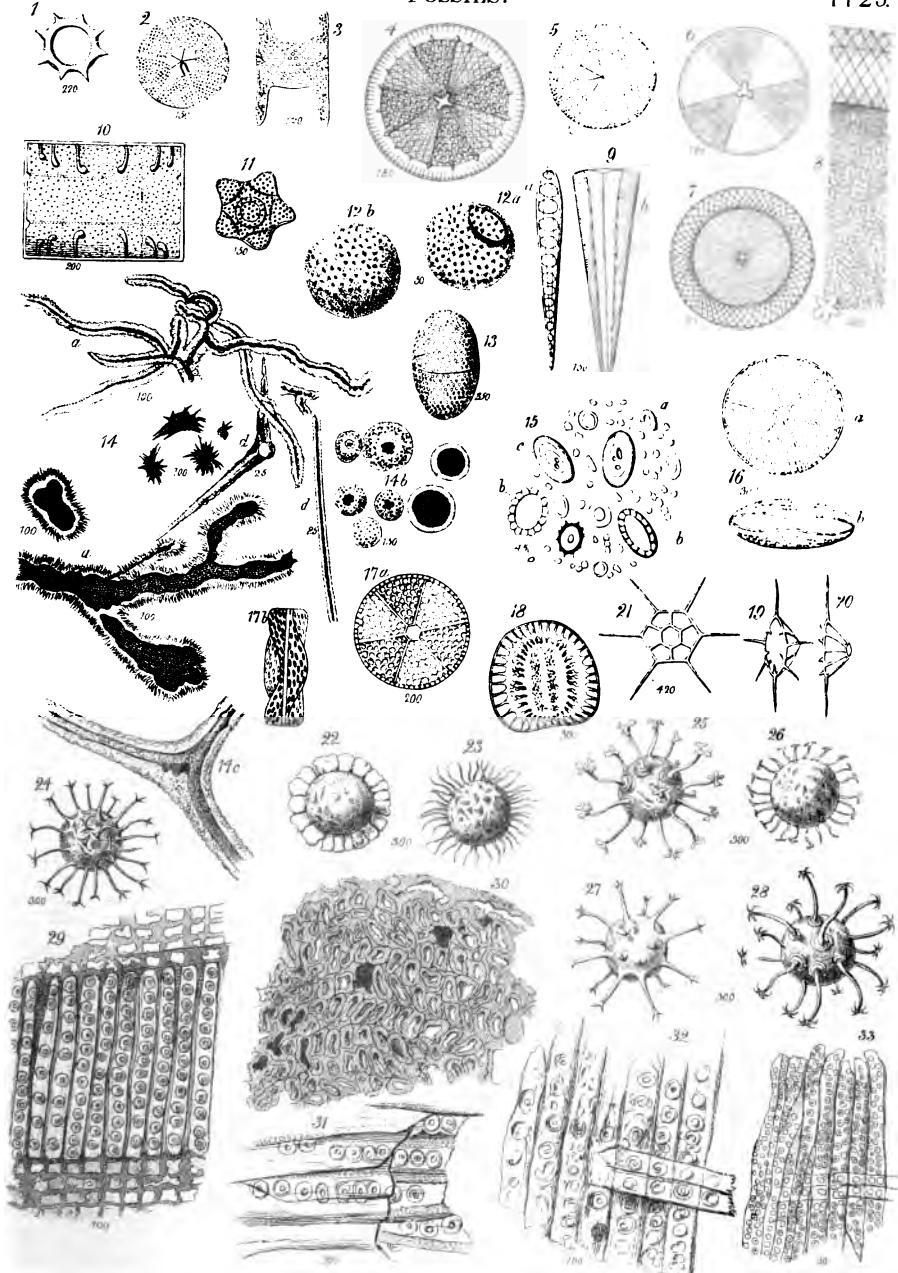




## PLATE 25.—Fossils.

### Figure

1. *Mesocena octogona*.
2. *Asteromphalus Hookerii*, side view.
3. *Hemiaulus antarcticus*, front view.
4. *Heliopeleta Leeuwenhoeckii*, side view.
5. *Asterolampra marylandica*, side view.
6. *Symbolophora trinitatis*, side view.
7. *Coscinodiscus craspedodiscus*, side view.
8. *Coscinodiscus craspedodiscus*, half a valve.
9. *Climacosphenia moniligera*. *a*, side view; *b*, front view.
10. *Terpsinoe musica*, front view: side view, Pl. 19. fig. 33.
11. *Amphipentas alternans*, side view.
12. Bodies found in flint, nature doubtful (see *Pyxidicula*).
13. *Pyxidicula major*, front view.
14. Moss-agate. *a, a*, silicified fibres of sponge; *b*, gemmules; *c*, branched fibre; *d*, spicula.
15. Crystalloids of coccolithic chalk. *a*, simple rings; *b*, radiately striated rings; *c*, disks.
16. *Actinoptychus senarius*. *a*, side view; *b*, front view.
17. *Actinocyclus undulatus*. *a*, side view; *b*, front view.
18. *Campylodiscus clypeus*.
19. *Dictyoche gracilis*, oblique view.
20. *Dictyoche gracilis*, side view.
21. *Dictyoche gracilis*, front view.
22. }
23. }
24. }
25. Fossil bodies from flint, so-called Xanthidia, but consisting of the sporangia of the Desmidaceæ.
26. }
27. }
28. }
29. Vertical (radial) section of coal from Disco, consisting of Coniferous wood (*Pinus*).
30. Transverse section of the same coal.
31. Splinter of the same.
32. Vertical section of silicified wood (*Pinus*) from Virginia.
33. Vertical section of silicified wood (*Araucaria*?) from Australia.



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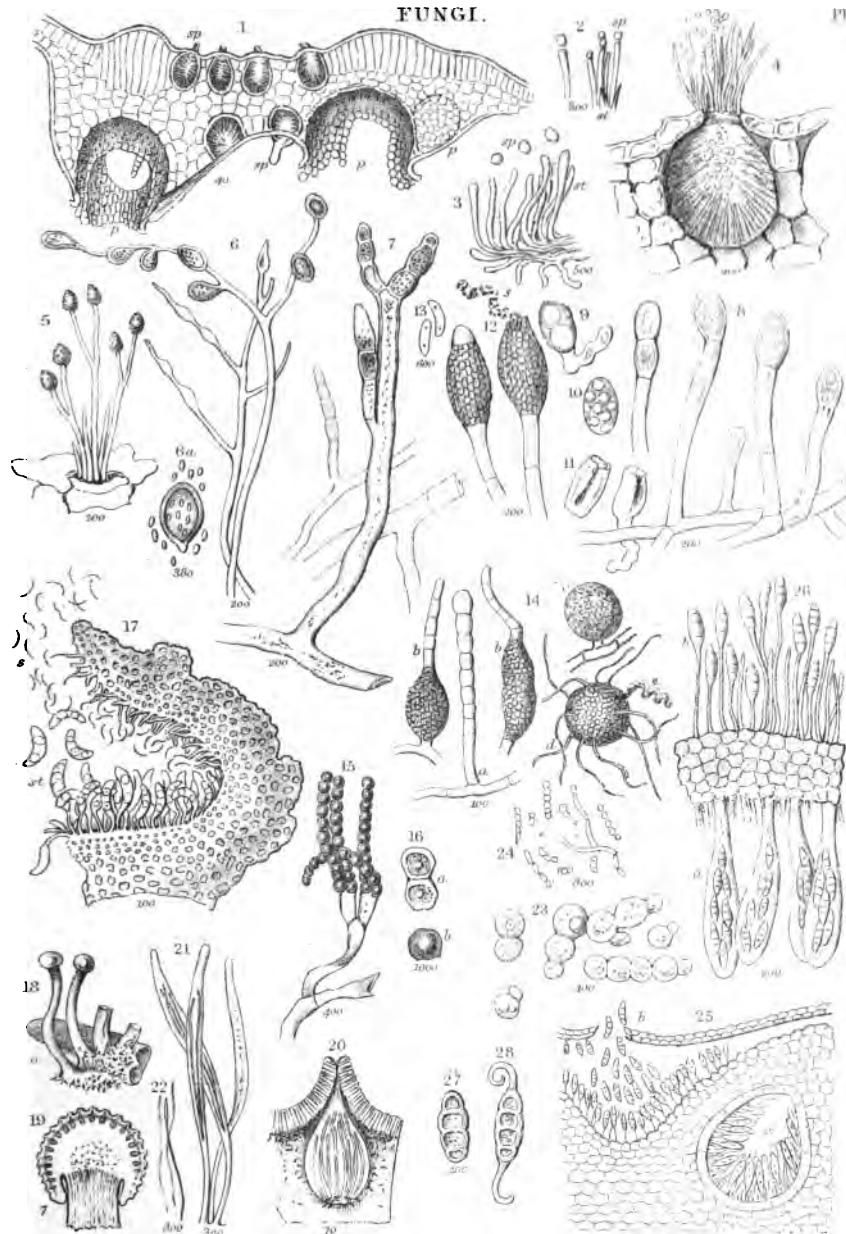
## PLATE 26.—Fungi.

### Figure

1. Vertical section of a leaf of black currant, infested with *Aecidium grossulariae*.  
*sp*, spermogonia; *p*, perithecia.
2. Sterigmata (*st*) and spermatia (*sp*) from the spermogonia of *Aecidium euphorbiæ*.
3. Ditto, from *Aecidium berberidis*.
4. Vertical section of a spermogonium of *Aecidium berberidis*.
5. *Botrytis infestans*, young plants growing out from a stoma of a potato.
6. Full-grown plants of the same. 6 *a*, spore of ditto.
7. *Torula*, growing in urine (not diabetic).
8. Grape-fungus, conidial form (*Oidium Tuckeri*) as commonly found on the leaves and fruits.
- 9-11. Conidia of the same, germinating.
12. Sporiferous form (*Cicinobolus*).
13. Spores from the same.
14. Hop-mildew, *Erysiphe (Sphaerotheca) Castagnei*. *a*, Oidial form; *b*, *b*, form resembling *Cicinobolus*; *c*, *d*, Erysiphal form; *e*, spores.
15. Fragment from the summit of a fertile filament of *Penicillium glaucum*.
16. Spores of ditto. *a*, two still united; *b*, one detached.
17. Section of a conceptacle of *Cenangium fraxini*, containing *st*, stylospores, and *s*, spermatia.
18. Ergot of rye, *Claviceps purpurea*, Tulasne; fruits sprouting from the ergot.
19. Vertical section of the head of one of the fruits, bearing conceptacles in its periphery.
20. Vertical section of a conceptacle containing ascii.
21. Ascii removed from the same.
22. Spores from the interior of the ascii.
23. Yeast-fungus (*Torula cerevisiae*), large form at the bottom of liquid.
24. Ditto, minute form, appearing as a white mealy substance on the surface of stale beer.
25. *Sphaeria inquinans* (*a*) with *Stilbospora macrosperma* (*b*) in the bark of an elm-tree.
26. A portion of the common matrix separating the two, with the stylospores of *Stilbospora* (*b*) above, and the ascii of *Sphaeria* (*a*) below.
27. Spore of *Stilbospora macrosperma*.
28. Spore of *Sphaeria inquinans*.

FUNGI.

PT 26.



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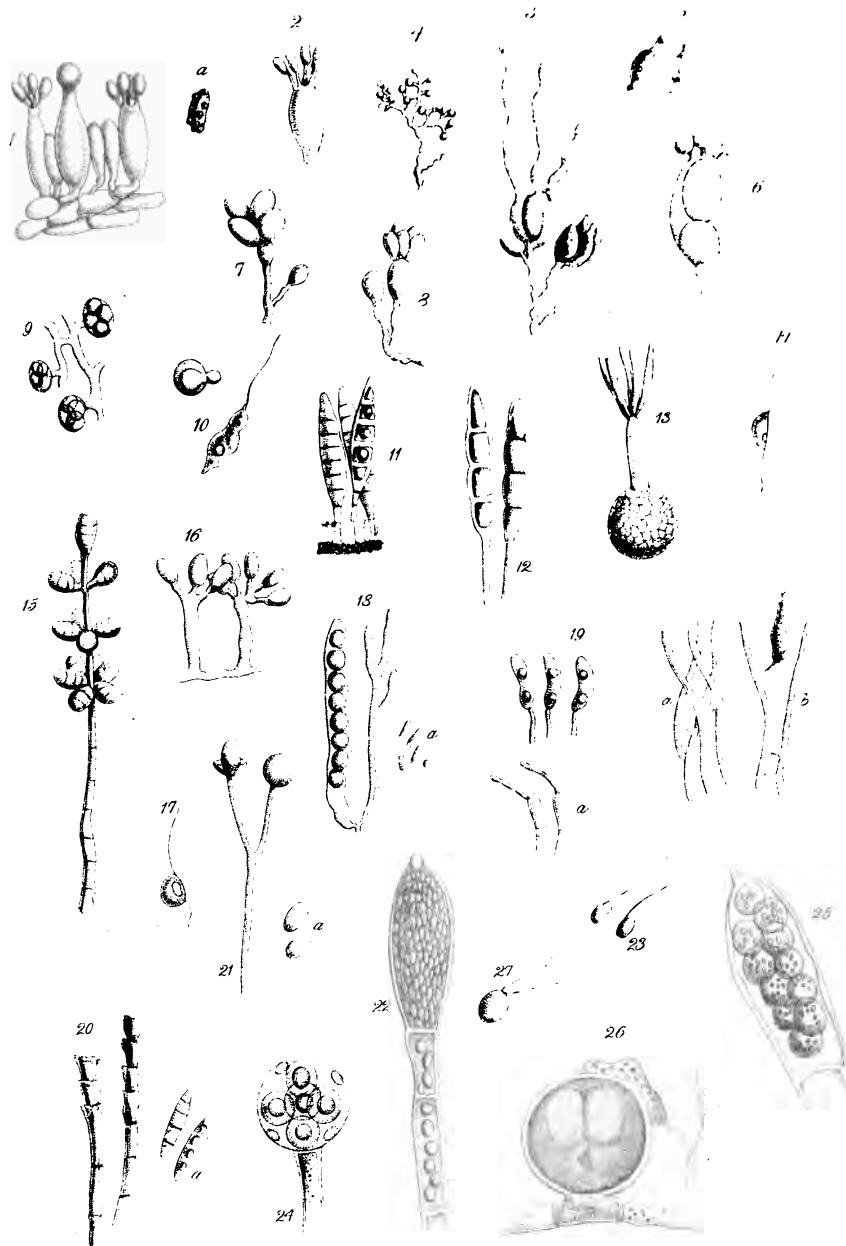
## PLATE 27.—**Fungi.**

Highly magnified.

**Figure**

1. Part of hymenium of *Agaricus trachispora*, with sporophores, spores, and cystidium. *a*, spore.
2. Sporophore with spores of *Agaricus nebularis*.
3. Fertile threads of *Tremella mesenterica*, with lobed sporophores and elongated spicules, one of which bears a spore.
4. Threads of the same, bearing conidia.
5. Spores of *Dacrymyces sebaceus*, producing secondary spores.
6. Sporophore of *Geaster rufescens*, with its spicules and spores.
7. Sporophore of *Cyathus striatus*, with spores.
8. Sporophore of *Rhizopogon luteolus*, with spores.
9. Threads and cysts containing spores of *Enerthenema elegans*.
10. Germinating spore and amoeboid of *Stemonitis obtusata*.
11. Spores springing from the wall of the peritheciun in *Hendersonia elegans*.
12. Spores of *Sporidesmium atrum*.
13. Germinating pseudo-spore of *Tilletia caries*. *a*, further development of anastomosing threads; *b*, the same producing a secondary spore.
14. Zoospore of *Cystopus candidus*.
15. Thread with spores of *Spondylocladium fumosum*.
16. *Peronospora curta*.
17. Zoospore of *Peronospora umbelliferarum*.
18. Ascus and paraphysis of *Peziza hydnica*; *a*, conidia.
19. Stylospores of *Cenangium fraxini*; *a*, spermatia of same.
20. Conidiiferous threads of *Sphaeria cupulifera*; *a*, sporidia.
21. *Mucor (Ascophora) rhizopogonis*, with an entire and ruptured vesicle with its columella; *a*, spores of same.
22. End of filament of male plant of *Saprolegnia dioica*.
23. Spermatozoids.
24. Oogonium of same.
25. Tip of male plant of the same, producing globular bodies filled with spermatozoids.
26. Young oogonium of the same, with antheridium attached.
27. Zoospore of *Saprolegnia lactea*.

## FUNGI.







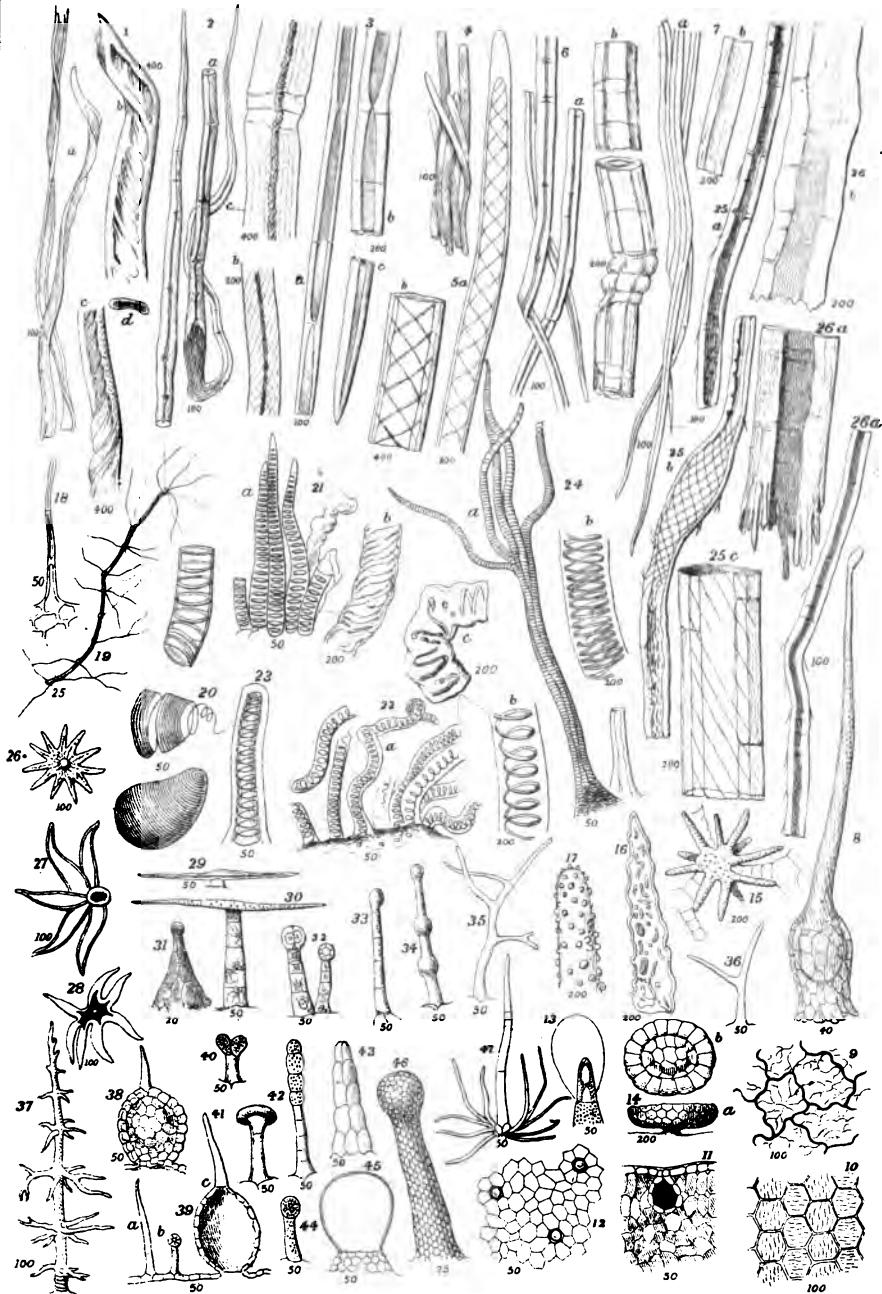
## PLATE 28.—Hairs, Fibres, Glands, &c. of Plants.

### Figure

1. Cotton. *a*, normal condition ; *b*, portion treated with sulphuric acid and iodine ; *c*, a fragment of gun-cotton ; *d*, transverse section of cotton-fibre.
2. Flax. *a*, normal fibre ; *b*, portion boiled with nitric acid ; *c*, treated with nitric acid, and afterwards with sulphuric acid and iodine.
3. Jute. *a*, normal fibre ; *b*, *c*, portions boiled with nitric acid.
4. Coir (cocoa-nut fibre), bundle of fibres.
5. Ditto. *a*, *b*, portions of fibres boiled with nitric acid.
6. Hemp. *a*, normal fibre ; *b*, portions boiled with nitric acid.
7. Manilla hemp. *a*, normal fibres ; *b*, fragment boiled with nitric acid.
8. Sting of *Urtica urens*.
9. Surface of the cuticle of *Helleborus foetidus*.
10. Ditto of *Cakile americana*.
11. Imbedded gland of *Ruta graveolens*, vertical section.
12. Glands of *Magnolia*, seen from above.
13. Hair of *Siphocampylus bicolor*, the cuticle detached by sulphuric acid.
14. Glands of hop. *a*, side view ; *b*, from above.
15. Stellate body from the air-spaces in the leaf of *Nuphar lutea*.
16. Hair of *Delphinium pinnatifidum*.
17. Hair of *Anchusa crista*.
18. Hair of *Pelargonium*.
19. Branched hair of *Verbascum Thapsus*.
20. Scale-like hairs from the seed of *Cobaea scandens*.
21. Annulated hairs from the seed of *Ruellia formosa*, in water ; *b*, detached cell-wall.
22. Spiral-fibrous hairs from the seed of *Collomia grandiflora*, in water. *b*, *c*, fragments showing the cell-wall and free fibre.
23. Hair from the seed of a *Salvia*.
24. Hair from the seed of *Acanthodium spicatum*. *b*, a fragment of a branch.
25. Chinese grass-cloth fibre. *a*, normal fibre ; *b*, fragments boiled with nitric acid ; *c*, afterwards treated with sulphuric acid and iodine.
26. Puya fibre. *a*, normal fibre ; *b*, fragments boiled with nitric acid ; *c*, afterwards treated with sulphuric acid and iodine.
- 26\*. Stellate hairs from the epidermis of *Deutzia scabra*.
27. Stellate hair of ivy-leaf.
28. Stellate hair of *Alyssum*.
29. Horizontal stalked hair of *Grevillea lithodophylla*.
30. T-shaped hair of garden *Crysanthemum*.
31. Ramentum or scale from a germinating fern.
32. Hair from the bulbil of *Achimenes*.
33. Hair from the corolla of *Digitalis purpurea*.
34. Hair from the corolla of *Antirrhinum majus*.
35. Branched hair from the epidermis of *Sisymbrium sophia*.
36. Forked hair from *Capsella bursa-pastoris*.
37. Branched hair of *Alternanthera axillaris*.
38. Gland of *Dictamnus fraxinella*.
39. Epidermis of *Dictamnus fraxinella*. *a*, *b*, hairs ; *c*, gland vertically divided.
40. Glandular hair of *Lysimachia vulgaris*.
41. Glandular hair of *Scrophularia nodosa*.
42. Glandular hair of *Bryonia alba*.
43. Scale of *Begonia planatifolia*
44. Glandular hair of *Gilia tricolor*.
45. Vertical section of papilla of *Mesembryanthemum crystallinum*.
46. Sets of a rose.
47. Tufted hair of *Marrubium creticum*.

## HAIRS, FIBRES, & GLANDS OF PLANTS.

PL. 28



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## PLATE 29.—Hairs of Animals.

### Figure

1. Human whisker, white; air partly displayed from medulla.
2. Human hair, transverse sections.
3. Human hair, foetal, with imbricated scales.
4. Monkey, Indian (*Semnopithecus*).
5. Lemur.
6. Bat, Indian.
7. Bat, Australian.
8. Mole (*Talpa europaea*).
9. Lion (*Felis leo*); *a*, by transmitted, *b*, by reflected light.
10. Bear (*Ursus arctos*).
11. Wolf (*Canis lupus*).
12. Coati-mondi (*Nasua*).
13. Seal, Falkland-Island (*Phocena falklandica*).
14. Horse (*Equus caballus*).
15. Elephant (*Elephas indicus*), segment of a transverse section.
16. Pig (*Sus scrofa*).
17. *Cheiropotamus*.
18. Camel (*Camelus bactrianus*).
19. Dromedary (*Camelus dromedarius*).
20. Deer, moose- (*Cervus alces*).
21. Deer, musk- (*Moschus moschiferus*).
22. Wool, sheep (*Ovis aries*).
23. Sloth (*Bradypus didactylus*).
24. Armadillo (*Dasyurus sexcinctus*).
25. Beaver (*Castor fiber*).
26. Shrew (*Amphisorex rusticus*).
27. Mouse (*Mus musculus*).
28. Ditto, treated with potash.
29. Guinea-pig (*Cavia cobaya*).
30. Squirrel (*Sciurus vulgaris*).
31. Rabbit (*Lepus cuniculus*).
32. Sable (*Mustela zibellina*).
33. Mink-sable (*Mustela lutreola*).
34. Badger (*Meles taxus*).
35. Chinchilla (*Chinchilla lanigera*).
36. Kangaroo (*Macropus*).
37. Opossum (*Didelphys virginiana*).
38. *Ornithorhynchus paradoxa*. *a*, entire hair; *b*, *c*, *d*, and 38\*, portions, more magnified.
39. Crab (*Cancer mænas*), from antenna of.
40. Spider (*Lycosa saccata*).
41. Spider (*Mygale*).
42. Spider from South America.

## HAIRS

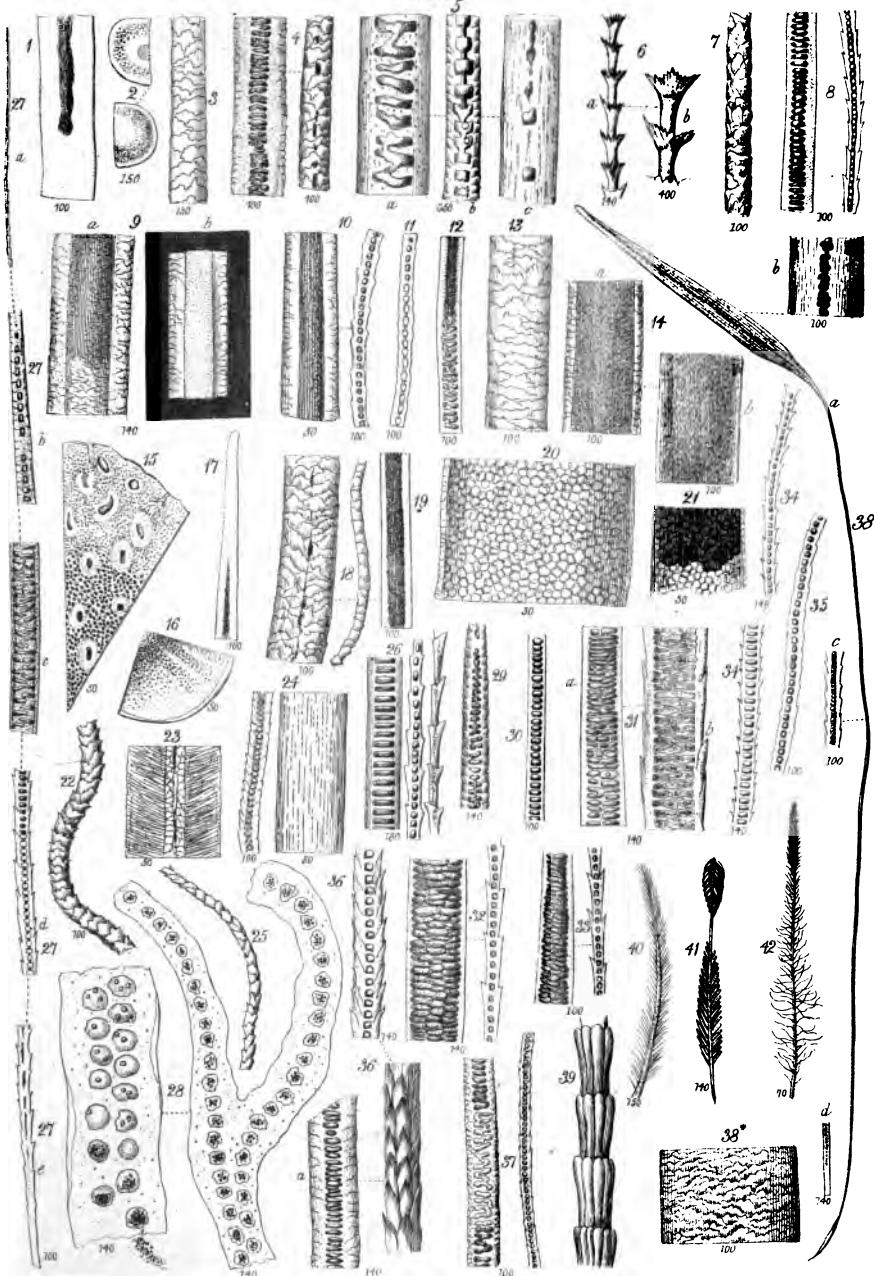






PLATE 30.—*Infusoria*.

Figure

1. *Actinaria incurvata*, Duj.
2. *Actinaria acuta*, D.
3. *Acomia vitrea*, D.
4. *Acineta tuberosa*, Ehr.
- 5a. *Podophrya fixa*, E.; 5b, the same, or the *Podophrya*-stage of *Vorticella*?
6. *Actinophrya viridis*, E.
- 7a. *Actinophrya Eichornii*, E.; 7b, *Actinophrya sol*, E.
8. *Alyecum saltans*, D.
9. *Anæba diffusa*, E.; 9a, expanded; 9b, contracted.
10. *Amphileptus fasciola*, E. 10a, dorsal view; 10b, side view.
11. *Amphimonas dispar*, D.
12. *Anisonema sulcata*, D.
13. *Anthophysa Mülleri*, Bory, Duj. (*Epistylis vegetans*, E.); 13a, entire organism; b, single body.
- 14a. *Arcella vulgaris*, E., dorsal view; 14b, *Arcella aculeata*, E., under view; 14c, *Arcella dentata*, E., under view.
- 15a. *Apidicus lynceus*, E., under view; 15b, *Asp. denticulata*, E., side view.
16. *Astasia hamatodes*, E., a, contracted; b, c, d, in different states of expansion.
17. *Astasia limpida*, D. (*A. pusilla*, E.). a, expanded; b, altered in shape.
- 18a. *Bodo grandis*, E.; 18b, c, *Bodo socialis*, E.
19. *Bursaria vernalis*, E., under surface.
20. *Carchesium polypinum*, E.
21. *Carchesium polypinum*, E., separate body.
22. *Cercononas acuminata*, D.
23. *Cercononas crassicauda*, D.
24. Various forms of *Trachelomonas*, arranged by Ehrenberg in the genera *Trachelomonas*, *Chatoglena*, and *Doxococcus*. See **TRACHELOMONAS**.
- 25a. *Chatomonas globulus*, E.; 25b, *Ch. constricta*, E.
26. a, b, *Chatotyphla armata*, E.; c, *Ch. aspera*, E.
27. *Chilodon cucullulus*, E., a, under view; b, side view.
28. *Chilomonas granulosa*, D.
29. *Chlamidodon mnemosyne*, E., ventral surface.
30. *Chlamidomonas pulvirculus*, E. (*Diselmis viridis*, D.), in various stages of development.
31. *Chlorogonium enchlorum*, E., (upper and lower figure) in different stages of development.
32. *Colacium vesiculosum*, left-hand figure; *C. stentorium*, right-hand figure.
33. *Coleps hirtus*, E. (a, after Ehr., b, after Duj.).
34. *Crumenula texta*, D.
- 35a. *Cryptoglena conica*, E.; 35b, *Cr. pigra*, E.
- 36a. *Cryptomonas ovata*, E.; b, *C. lenticularis*, E.; c, *C. fusca*, E.; d, *C. globulus*, D.; e, *C. inaequalis*, D.
- 37a. *Cyclidium distortum*, D.; b, *C. abecissum*, D.; c and d, *C. glaucoma*, E.: c, side view; d, dorsal view.
38. *Cyphidium aureola*, E. a, dorsal view; in b the expansion is seen.
39. *Difflugia proteiformis*, E., a and b.
40. *Dileptus folium*, D.
41. *Dinobryon sertularia*, E.
42. *Dinobryon petiolatum*, D.
43. *Diophrya marina*, D. a, under view; b, side view.
44. *Discocephalus rotatorius*, E. a, dorsal view; b, side view.
45. *Disoma vacillans*, E.
46. a, *Distigma proteus*, E.; b, *D. viride*, E.
47. a, *Doxococcus ruber*, E.; b, *D. pulvirculus*, E.
48. *Enchelys pupa*, E.
49. *Enchelys nodulosa*, D.
50. *Epipyxis utriculus*, E.
- 51a. *Epistylis anastatica*; 51b, single body of *E. branchiophila*; 51c, less magnified.
52. *Erilia legumen*, D. (*Egyria leg.*, Cl. & L.; *Euplates monostylus*, E.). a, under view; b, side view.
53. *Euglypha tuberculata*, D.
54. *Euglypha alveolata*, D.
55. *Amblyophis viridis*, E.







## PLATE 31.—Infusoria.

### Figure

1. *Euglena pyrum*, E.
2. *Euglena viridis*, E. *a*, *b*, in different states of contraction and extension.
3. *Euglena longicauda*, E. (*Phacus longicauda*, D.), with the body twisted. Fig. 63, the same, after Duj.; the body flat.
4. *Euglena acus*, E., undergoing longitudinal division.
5. *Euploea patella*, D. *a*, under view; *b*, lateral view.
6. *Euploea canus*, E., under view.
7. *Gastrochaeta fissa*, D.
8. *Glaucoma scintillans*, E.
9. *Peridinium cinctum*, E.
- 10 *a*, *b*. *Glenodinium cinctum*, E.; 10 *c* (between figs. 49 & 50), *Glenodinium apiculatum*, E.
11. *Peridinium fuscum*, E.
12. *Peridinium tripes*, E.
13. *Peridinium fusus*, E.
14. *Glenomorium tingens*, E.
15. *Gromia fluvialis*, D., with its expansions extended.
16. *Trichodina pediculus*, E. *a*, side view; *b*, under view.
17. *Heteronema marina*, D.
18. *Himantophorus charon*, E., under view.
19. *Himantophorus charon*, E., side view.
20. *Hexamita nodulosa*, D.
21. *Holophrya brunnea*, D.
22. *Holophrya ovum*, E.
23. *Ichthydium podura*, E.
24. *Chætonotus larus*, E.
25. *Colpoda cucullus*, E.
26. *Kerona pustulata*, D. (*Stylochichia p.*, E.).
27. *Kerona mytilus*, D. (*Stylochichia m.*, E.), under view.
28. *Kerona mytilus*, D. (*Stylochichia m.*, E.), side view.
29. *Stylochichia histrion*, E., under view.
30. *Stylochichia lanceolata*, E. *a*, under view; *b*, side view.
31. *Kondylostoma patens*, D., under view.
32. *Kondylostoma patens*, D., half side view.
33. *Trachelocerca viridis*, E.
34. *Amphileptus papillifer*, E.
35. *Lagenella euklora*, E.
36. *Cryptomonas* (*Lagenella*, E.) *inflata*, D.
37. *Leucophrys striata*, D.
38. *Leucophrys patula*, E. *a*, dorsal, *b*, ventral surface.

### Figure

39. *Loxodes rostrum*, E. (*Pelecidea rostrum*, D.).
40. *Loxodes dentatus*, D.
41. *Loxodes bursaria*, E., under view.
42. *Loxophyllum* (*Amphileptus*, E.) *meleagris*, D. *a*, dorsal view; *b*, anterior portion twisted.
43. *a*, *Microglena punctifera*, E.; *b*, *M. monadina*, E.
44. *a*. *Monas lens*, D.; *b*, the same (?) with two anterior cilia; *c*, *M. attenuata*, D.
45. *Nassula elegans*, E.; *b*, teeth.
46. *Nassula aurea*, E.
47. *Opalina* (*Bursaria*, E.) *ranarum*, Purk. and Val.
48. *Ophrydium versatile*, E., portion expanded by compression.
49. *Ophrydium versatile*, E., marginal portion, in the natural state.
50. *Ophrydium versatile*, E., isolated body.
51. *Ophryoglena atra*, E.
52. *Oxytricha pellionella*, D.
53. *Oxytricha gibba*, F., side view.
54. *Oxyrrhis marina*, D.
55. *Panophys chrysalis*, D.
56. *Paramecium aurelia*, E., dorsal view.
57. *Paramecium aurelia*, E., side view.
58. *Pantotrichum lagenula*, E.
59. *Peranema globulosa*, D.
60. *Phialina vermicularis*, E.
61. *Phialina viridis*, E.
62. *Phacus* (*Euglena*, E.) *pleuronectes*, D.
63. *Phacus* (*Euglena*, E.) *longicauda*, D.
64. *Plagiota lumbri*, D.
65. *Planariola rubra*, D.
66. *Pleuronema chrysalis*, D.
67. *Pleotia virea*, D.
68. *Polyselma viridis*, D.
69. *Polytoma uvella*, E.
70. *Prorocentrum micans*, E.
71. *Prorocentrum micans*, E., side view.
72. *Prorodon teres*, E.
73. *Prorodon teres*, E., teeth.
74. *Scyphidia rugosa*, E.
75. *Spathidium hyalinum*, D. (*Leucophrys spathula*, E.).
76. *Spathidium hyalinum*, D., anterior part twisted.
77. *Spirostomum ambiguum*, E.
78. *Spirostomum ambiguum*, E.; posterior end more magnified.

INFUSORIA.

PI 31.



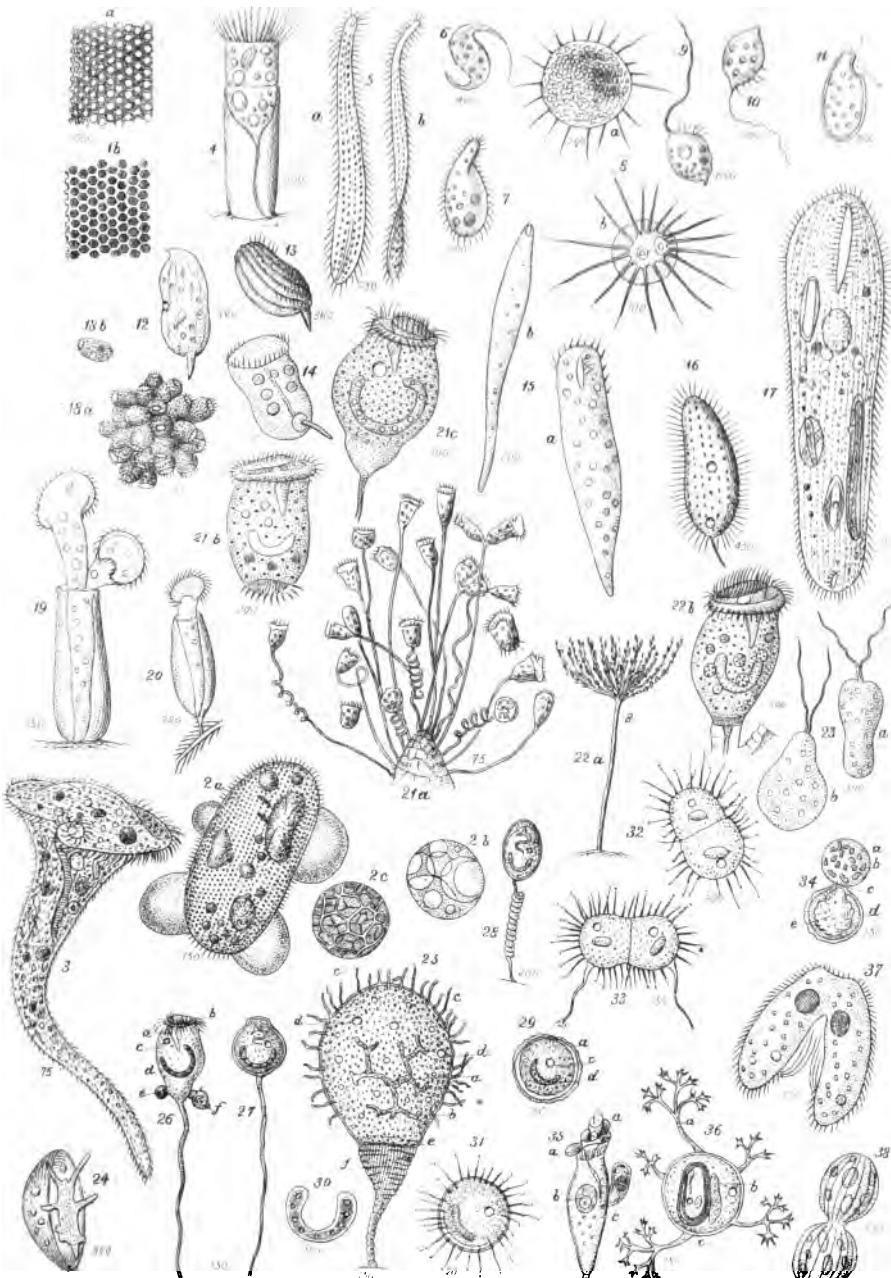




## PLATE 32.—Infusoria.

### Figure

1. Tegument of *Paramecium aurelia*, dried, showing the depressions at different foci, &c. (Int. p. xxxvii.)
2. *Paramecium aurelia*. *a*, with globules of sarcode; *2 b*, free globule of sarcode, with numerous vacuoles; *2 c*, the same, become reticular.
3. *Stentor Müllerii*, E.
4. *Tintinnus inquinatus*, E.
5. *Trachelium lamella*, D., *a* and *b*.
6. *Trepomonas agilis*, D.
7. *Trichoda angulata*, D.
8. *Trichodiscus sol*, E.
9. *Trichomonas vaginalis*, D.
10. *Trichomonas limacis*, D.
11. *Trinema acinus*, D., = *Euglypha pleurostoma*, Cart.
12. *Trochilia sigmoides*, D., ventral view.
13. *Trochilia sigmoides*, D., dorsal view.
14. *Urocentrum turbo*, E.
15. *Uroleptus piscis*, E., *a*; *b*, *U. lamella*, E.
16. *Uronema marina*, D.
17. *Urostyla grandis*, E.
18. *Uvella virescens*, E., *a* and *b*.
19. *Vaginicola crystallina*, E.
20. *Cothurnia imberbis*, E.
21. *Vorticella nebulifera*, E., *a*; *21 b*, body separated by division; *21 c*, body of *V. microstoma*, showing the mouth, the nucleus (auct.; testis, E.), and the contractile vesicle (vesic. seminal., E.).
22. *Zoothamnium arbuscula*, E., *a*; *22 b*, separate body of *Z. affine*.
23. *Zygoselmis nebulosa*, D., *a*, *b*, in different states of contraction.
24. *Arcella vulgaris*, E., half side view of young, with expansions extended.
25. *Acineta*-stage of *Opercularia articulata*, E. *a*, dendritic nucleus; *b*, envelope; *c*, tentacles; *d*, vacuoles; *e*, group of fat-granules; *f*, enlarged stalk.
26. *Vorticella microstoma*, E., full-grown. *a*, oesophagus; *b*, peristome; *c*, contractile vesicle; *d*, nucleus; *e*, gemma or bud; *f*, mature bud.
27. *Vorticella microstoma*, E. (old), encysted upon its extended stalk, with its nucleus, contractile vesicle, and retracted cilia.
28. *Vorticella microstoma*, E. (young), encysted upon its contracted stalk.
29. *Vorticella microstoma*, E., encysted and stalkless. *a*, cyst; *c*, contractile vesicle; *d*, nucleus.
30. Isolated nucleus of an old *Vorticella microstoma*.
31. *Actinophrys*-stage of *Vorticella microstoma*. The cyst is partly separated from its contents; the nucleus and contractile vesicle are visible.
32. Two of the above in conjugation.
33. Two *Podophrya*-stages of *Vorticella microstoma* in conjugation.
34. Cyst of *Vorticella microstoma* discharging its brood of germs. *a*, gelatinous substance, containing *b* the germs; *c*, neck-like orifice of parent vesicle; *d*, cyst; *e*, parent vesicle.
35. *Spirochona gemmipara*, Stein. *a*, peristome with its funnel-shaped process; *b*, nucleus; *c*, gemma or bud.
36. *Acineta*-stage of the same. *a*, tentacles; *b*, nucleus; *c*, mature swarm-germ.
37. *Paramecium chrysalis*, E., undergoing longitudinal division.
38. *Glaucoma scintillans*, E., undergoing transverse division.



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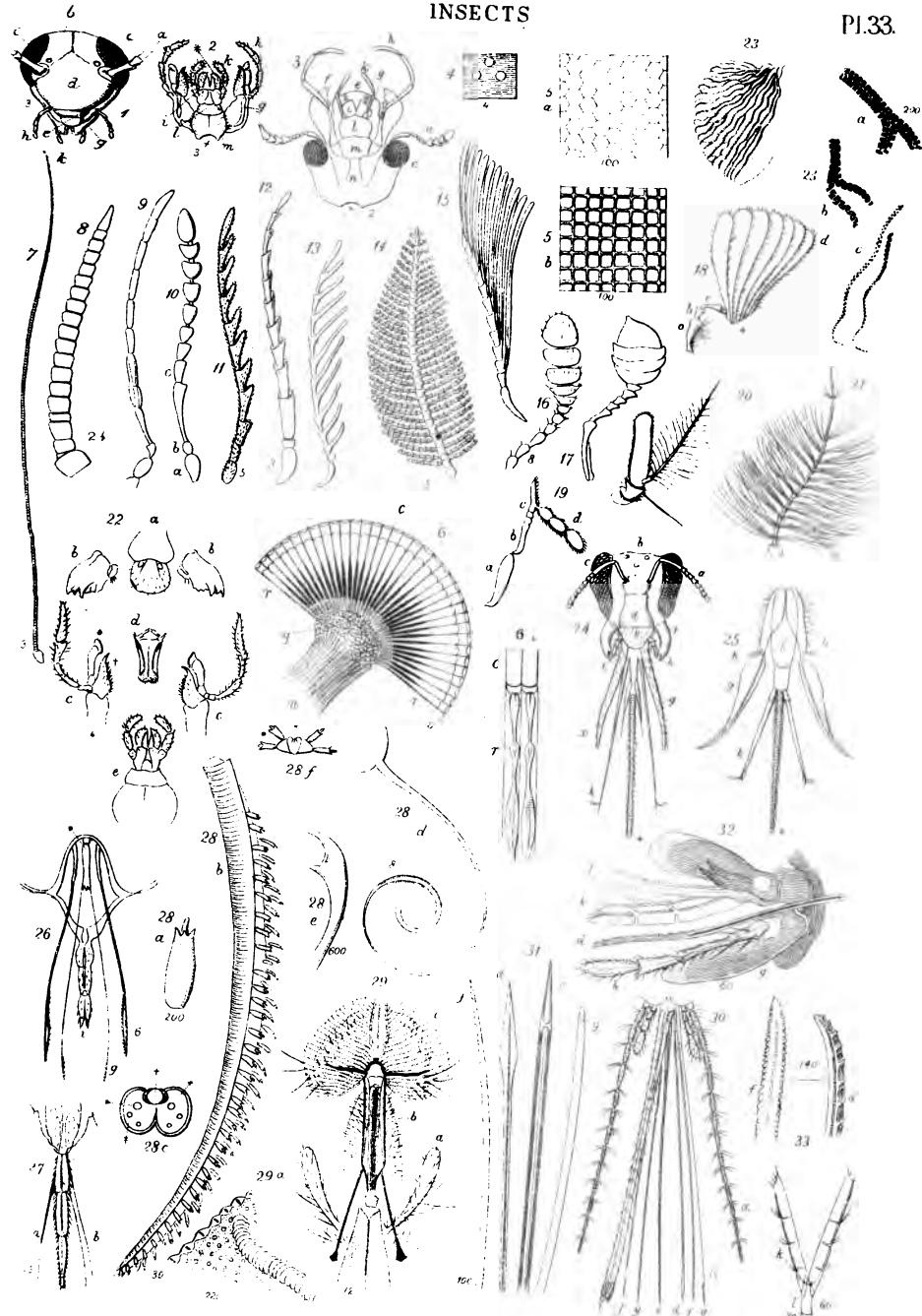




## PLATE 83.—Insects.

### Figure

1. Head of *Blatta orientalis*, from before. *a*, antennæ, cut off; *b*, epicranium; *c*, eyes; *d*, clypeus; *e*, labrum; *g*, maxillæ; *h*, maxillary palpi; *k*, labial palpi.
2. Head of *Blatta orientalis*, under portion. *a*, stipes; *h*, palp of maxilla; *i*, palpiger; *k*, palp; *l*, mentum; \* paraglossa of labium; *m*, submentum and gula;  $\times$  occiput.
3. Head of *Hydrois piceus*, under view. *a*, antennæ; *c*, eye; *e*, labrum; *f*, mandible; *g*, maxilla; *h*, maxillary palp; *i*, ligula; *k*, labial palp; *l*, mentum; *m*, submentum; *n*, gula;  $\times$  occiput.
4. Ocelli of *Agrion fulvipes*.
5. Portions of cornea of eye of *Acheta domestica*. *a*, with hexagonal, *b*, with quadrangular facets.
6. Perpendicular section of part of the eye. *c*, faceted cornea; *g*, ganglionic expansion of *n*, the optic nerve; *r*, bacilli arising from the ganglion, surrounded by choroid pigment.  $\delta^*$ , corneal lenses *c*, with bacilli *r*; from eye of a beetle.
7. Antenna, setaceous (Achetidae, &c.).
8. Antenna, ensiform (Locustidae).
9. Antenna, filiform (Carabidae).
10. Antenna, moniliform (Tenebrionidae, &c.). *a*, scapus; *b*, pedicella; *c*, clavola.
11. Antenna, serrated (Elateridae).
12. Antenna, imbricated (Prionidae).
13. Antenna, pectinated (Lampyridæ).
14. Antenna, bipectinated (Bombycidae).
15. Antenna, flabellate (Elateridae).
16. Antenna, clavate (Coleoptera).
17. Antenna, capitate (Coleoptera).
18. Antenna, lamellate and perfoliate (*Melolontha*). *a*, scapus; *b*, pedicella; *c*, clavola; *d*, lamellæ.
19. Antenna of *Globaria*. *a*, scapus; *b*, pedicella; *c*, clavola; *d*, capitulum.
20. Antenna, plumose (Muscidae).
21. Antenna, plumose (*Culex pipiens*, male).
22. Trophi of *Blatta orientalis*. *a*, labrum; *b*, mandibles; *c*, maxillæ ( $\dagger$  lacinia, \* galea); *d*, internal tongue; *e*, labium.
23. Tongue of cricket (*Acheta domestica*). *a*, *b*, *c*, parts of a fibre more magnified.
24. Head of mason-bee (*Anthophora retusa*), front view. *a*, antenna; *b*, ocelli; *c*, eye; *d*, clypeus; *e*, labrum; *f*, mandible; *g*, maxilla; *h*, its palp; *i*, palpiger or part of the ligula; *k*, labial palp; \* ligula, commonly called the tongue;  $\times$ , paraglossæ.
25. Maxillæ and labium of honey-bee (*Apis mellifica*). *g*, maxilla; *h*, its palp; *k*, labial palp; *l*, mentum; \* ligula, commonly called the tongue.
26. Trophi of water-scorpion (*Nepa cinerea*). \* lingua; *f*, mandibles; *g*, maxilla; *i*, labium.
27. Trophi of bug (*Cimex lectularius*). *a*, mandibles united; *b*, maxillæ; the median organ is the labium.
28. Antlia of red admiral butterfly (*Vanessa atalanta*). *a*, separate papilla; *b*, end of antlia extended; *c*, transverse section of antlia near its root; \*  $\dagger$  tracheæ;  $\dagger$  tube; *a*, entire organ with two maxillæ slightly separated at the end; *e*, tooth; *f*, section near the end, showing the position of the papillæ \*, and the canal  $\times$ .
29. Proboscis of the blow-fly (*Musca vomitoria*). *a*, maxillary palpi; *c*, lobes of labium.  $29\ a$ , portion of margin more magnified.
30. Trophi of female gnat (*Culex pipiens*). *a*, antennæ; *d*, tongue; *e*, labrum; *ff*, mandibles; *gg*, maxillæ; *i*, labium.
31. Setæ of the same, more magnified. *d*, tongue; *e*, labrum; *f*, mandible; *g*, maxilla.
32. Trophi of flea (*Pedicex irritans*). *d*, labrum; *f*, mandibles or lancets; *g*, maxilla; *h*, maxillary palpi; *k*, sheaths corresponding to labial palpi.
33. Trophi of flea, more magnified. *d*, labrum; *f*, end of mandible; *k*, sheath; *l*, labium; *m*, mentum.



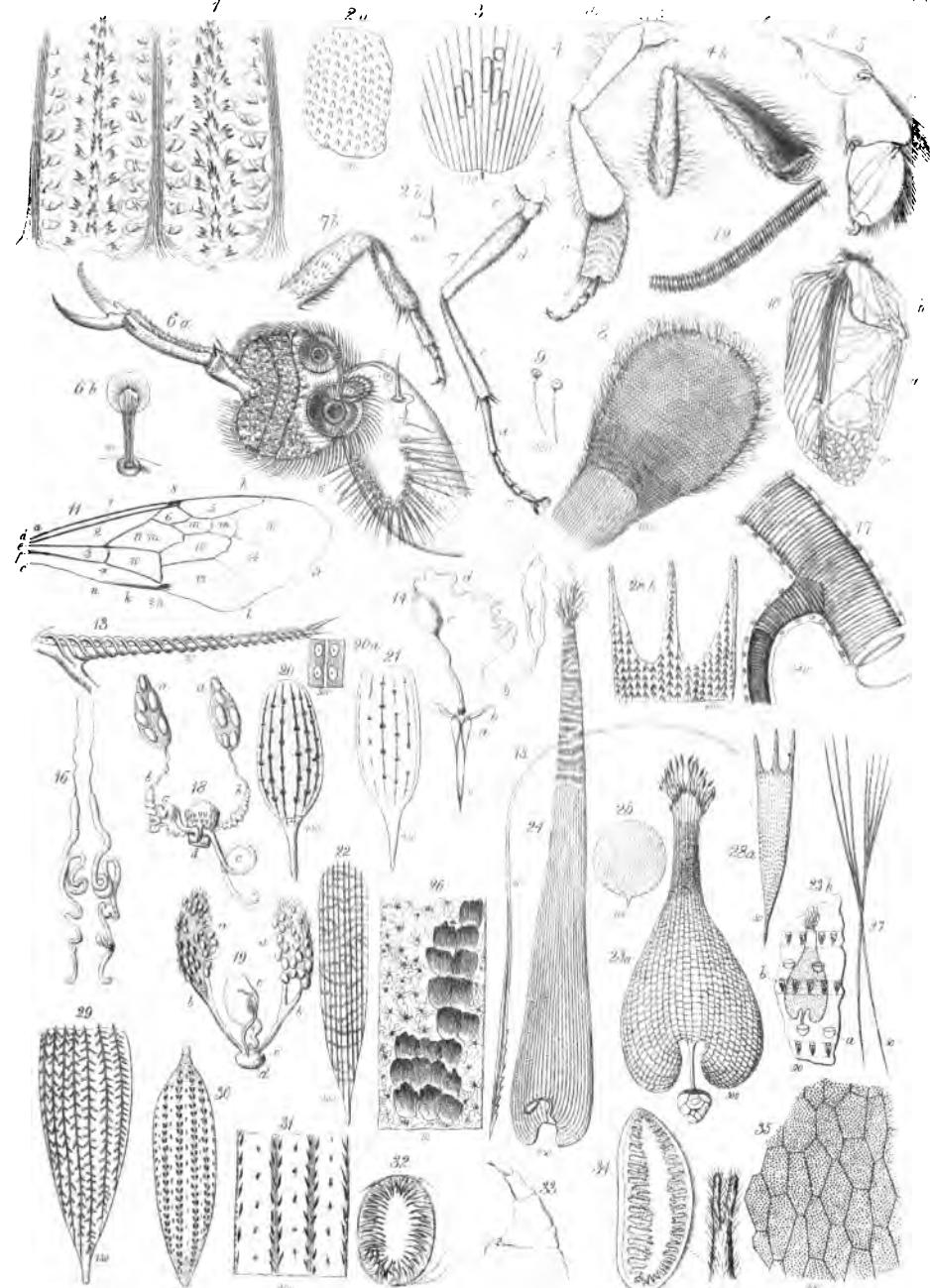




## PLATE 34.—Insects.

### Figure

1. Gizzard of cricket (*Acheta domesticus*).
- 2a. Under membrane of elytrum of cockchafer (*Melolontha vulgaris*); 2b, separate hair or spiniform papilla (ELYTRA).
3. Scale of *Lepisma saccharina*, in liquid, showing air-bubbles imprisoned by the longitudinal ridges.
4. Hind leg of neuter honey-bee (*Apis mellifica*), with pollen-brushes on the first joint of tarsus, a; c, tibia; d, femur; e, trochanter. 4b, outside of tibia hollowed out.
5. Leg of middle pair of *Gyrinus natator*. a, tarsus; c, tibia; d, femur; e, trochanter.
6. Anterior leg of male *Dytiscus marginalis*. a, tarsus, the first three joints with the suckers; b, one of the smaller ones more magnified; c, tibia.
7. Leg of fly (*Musca domestica*). a, tarsus; c, tibia; d, femur; e, trochanter. 7b, ear of cricket.
8. Tarsal pulvilli of blow-fly, with hair-like suckers.
9. One of the hair-like suckers of the same, more magnified.
10. Anterior wing of male cricket (*Acheta domesticus*). a, drum; b, file (fig. 12, the file more magnified).
11. Anterior wing of humble-bee (*Bombus terrestris*). n, fold over which the hooks of the posterior wing play. (See INSECTS, wings, and WINGS.)
12. File of cricket (compare fig. 10, b).
13. Costal nerve of hind wing of humble-bee (*Bombus terrestris*), with the hooks (See INSECTS, wings.)
14. Sting and poison-apparatus of mason bee (*Anthophora retusa*). a, b, sheath of sting; c, reservoir; d, duct; e, f, secretory organs.
15. Single sting of wasp (*Vespa vulgaris*).
16. Spinning-organs of silkworm (*Bombyx mori*).
17. Trachea of a caterpillar; lower part of the branch containing air.
18. Internal reproductive organs of male mole-cricket (*Gryllotalpa vulgaris*). a, testes; b, vasa deferentia; c, c', prostate (blind tubes); d, root of penis, with cæca (Cowper's glands) at the upper part.
19. Female organs of the same. a, a, ovaries; b, b, oviducts; c, receptacle of semen (blind sac), the very slender tube of which, c', opens into the vagina d.
20. Battledore scale of *Polyommatus argiolus*, dry; 20a, a portion immersed in water, and more magnified.
21. A scale of the same seen in Canada balsam.
22. Scale from the wing of the gnat (*Culex pipiens*).
- 23a. Scale from the wing of male *Pontia rapæ*, dry; 23b, portion of wing of the same, showing the attachments of the two kinds of scales, a and b.
24. Scale from wing of male *Pontia brassicae*, dry.
25. Scale from underside of wing of clothes-moth (*Tinea pellionella*).
26. Portion of wing of *Pontia brassicae*, dry, showing the imbricated arrangement of the scales, and the wrinkling of the epidermis at their insertions.
27. Hair-like scales from clothes-moth, dry.
- 28a. Scale from wing of *Lasiocampa quercus*, dry; 28b, upper portion of the same, more magnified, dry.
29. Scale from wing of *Papilio Paris*, dry.
30. Scale from larva of *Attagenus pellio*, dry.
31. Portion of the above, more magnified.
32. End of one of the posterior legs of the larva of a *Sphinx*.
33. Anterior leg of the same.
34. Spiracle of *Dytiscus marginalis*, with one of the marginal processes more magnified.
35. Portion of outer membrane of the ovum of the blow-fly (*Musca vomitoria*).



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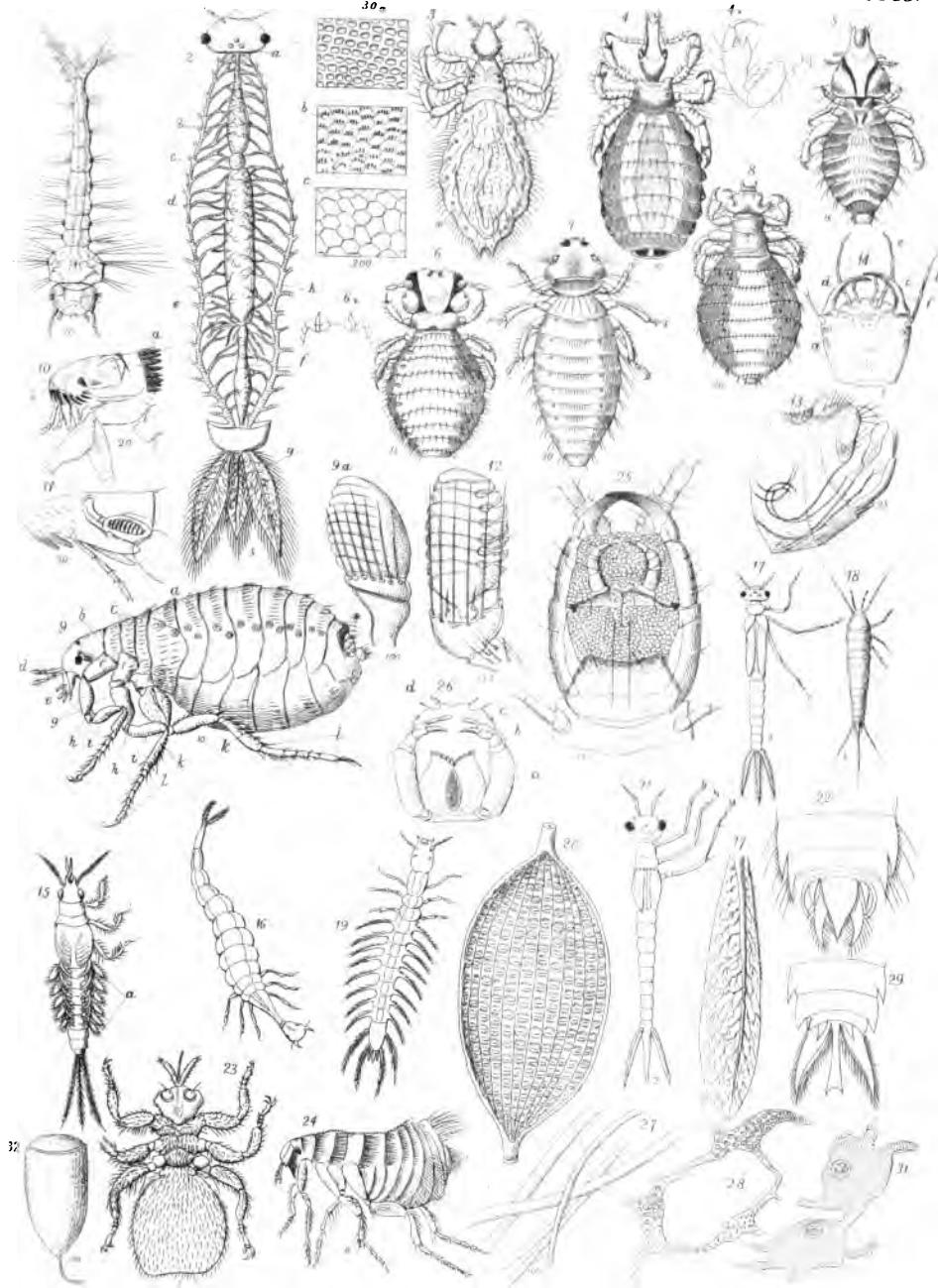




## PLATE 35.—Insecta.

### Figure

1. Larva of gnat (*Culex pipiens*).
2. Organs of larva of *Agrion puella*. *a*, ocelli; *b*, oesophagus; *c*, gizzard; *d*, stomach; *e*, Malpighian vessels truncated; *f*, intestine and rectum; *g*, caudal branchiae; *h*, tracheæ.
3. Clothes-louse (*Pediculus vestimenti*).
4. *Hæmatopinus suis*; 4\*, leg more magnified.
5. *Philopterus (Docophorus) communis*.
6. *Trichodectes latus*; 6\*, labium and labial palpi.
7. *Liotheum (Menopon) pallidum*.
8. *Gyropus ovalis*.
9. *Pulex felis* (flea of cat), female. *a*, spiracles; *b*, head; *c*, thorax; *d*, maxillary palpi; *e*, setæ; *f*, epimera; *g*, coxae; *h*, trochanter; *i*, femur; *k*, tibia; *l*, tarsus; *x*, pygidium; *9 a*, separate antenna.
10. Part of *Pulex canis* (dog's flea). *a*, prothoracic setæ; *b*, cephalic setæ.
11. Head of flea from common bat (PULEX).
12. Antenna of flea from pigeon (PULEX).
13. Posterior end of abdomen of pigeon's flea; male (PULEX).
14. Head of larva of *Dytiscus marginalis*. *a*, eyes; *b*, antennæ; *c*, mandibles; *d*, maxillæ; *e*, maxillary papi; *f*, labial palpi.
15. Pupa of *Ephemera vulgata*. *a*, abdominal branchiae.
16. Larva of *Acilius sulcatus* (formerly *Dytiscus sulc.*).
17. Pupa of *Agrion puella* (LIBELLULIDÆ); 17\*, caudal branchial plate.
18. *Lepisma saccharina*.
19. Larva of *Gyrinus natator*.
20. Rectum of *Aeschna grandis*; 20\*, portion more magnified (LIBELLULIDÆ).
21. Pupa of *Calepteryx virgo*.
22. End of abdomen of *Libellula ferruginea*.
23. Sheep-tick (*Melophila ovinus*).
24. Flea of the mole (PULEX).
25. Head of *Geophilus longicornis* (one of the MYRIAPODA).
26. Head of a *Lithobius* (one of the MYRIAPODA).
27. Fibres of silk-worm's silk.
28. Three lobes of the fatty body of the larva (caterpillar) of *Saturnia carpini*.
29. End of abdomen of *Aeschna grandis*.
30. Epidermis of cricket (*Acheta domestica*).
31. Fat-body of *Ichneumon*-larva, developing from cells.
32. Egg of an aquatic insect (?) common in bog-water.



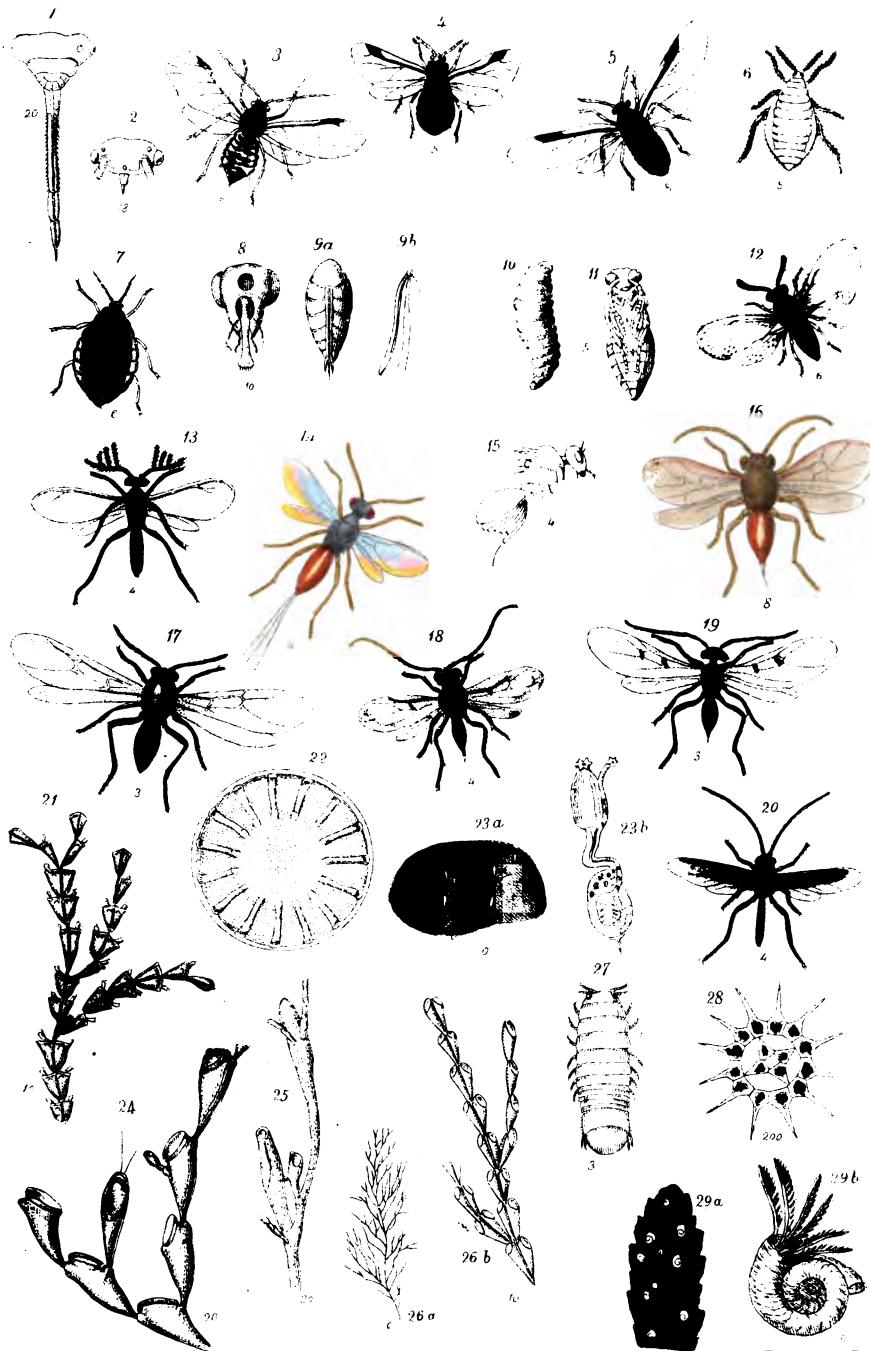




## PLATE 36.—Insects, etc.

### Figure

1. *Lachnus*, head of, from below (APHIDÆ).
2. *Aphis*, head of, from above (APHIDÆ).
3. *Aphis brassicae* (APHIDÆ).
4. *Tetraneura ulmi* (APHIDÆ).
5. *Pemphigus bursarius* (APHIDÆ).
6. *Trama radicis* (APHIDÆ).
7. *Forda formicaria* (APHIDÆ).
8. *Chalcidite*, head of (CHALCIDIDÆ).
9. *Chalcidite*: *a*, under surface of abdomen of female (CHALCIDIDÆ); *b*, separate ovipositor.
10. *Eulophus nemati*, larva of (CHALCIDIDÆ).
11. *Eulophus nemati*, pupa of (CHALCIDIDÆ).
12. *Encyrtus atricollis* (CHALCIDIDÆ).
13. *Eulophus pectinicornis* (CHALCIDIDÆ).
14. *Callimome cynipis* (CHALCIDIDÆ).
15. *Cynips*, section of abdomen of female (CYNIPIDÆ).
16. *Rhodites rosæ* (CYNIPIDÆ).
17. *Cynips folii* (CYNIPIDÆ).
18. *Teras terminalis* (CYNIPIDÆ).
19. *Neuropterus longipennis* (CYNIPIDÆ).
20. *Ibalia cultellata* (CYNIPIDÆ).
21. *Notamia bursaria*.
22. *Actinodiscus Barbadensis*.
23. *Distoma rubrum*: *a*, portion of common mass; *b*, individual body.
24. *Eucratea (Scruparia) chelata*.
25. *Salpingia Hassallii*.
26. *Gemellaria loricata*.
27. *Limnoria terebrans*.
28. *Monactinus duodenarius*.
29. *Spirorbis nautiloides*: *a* on seaweed; *b*, magnified.



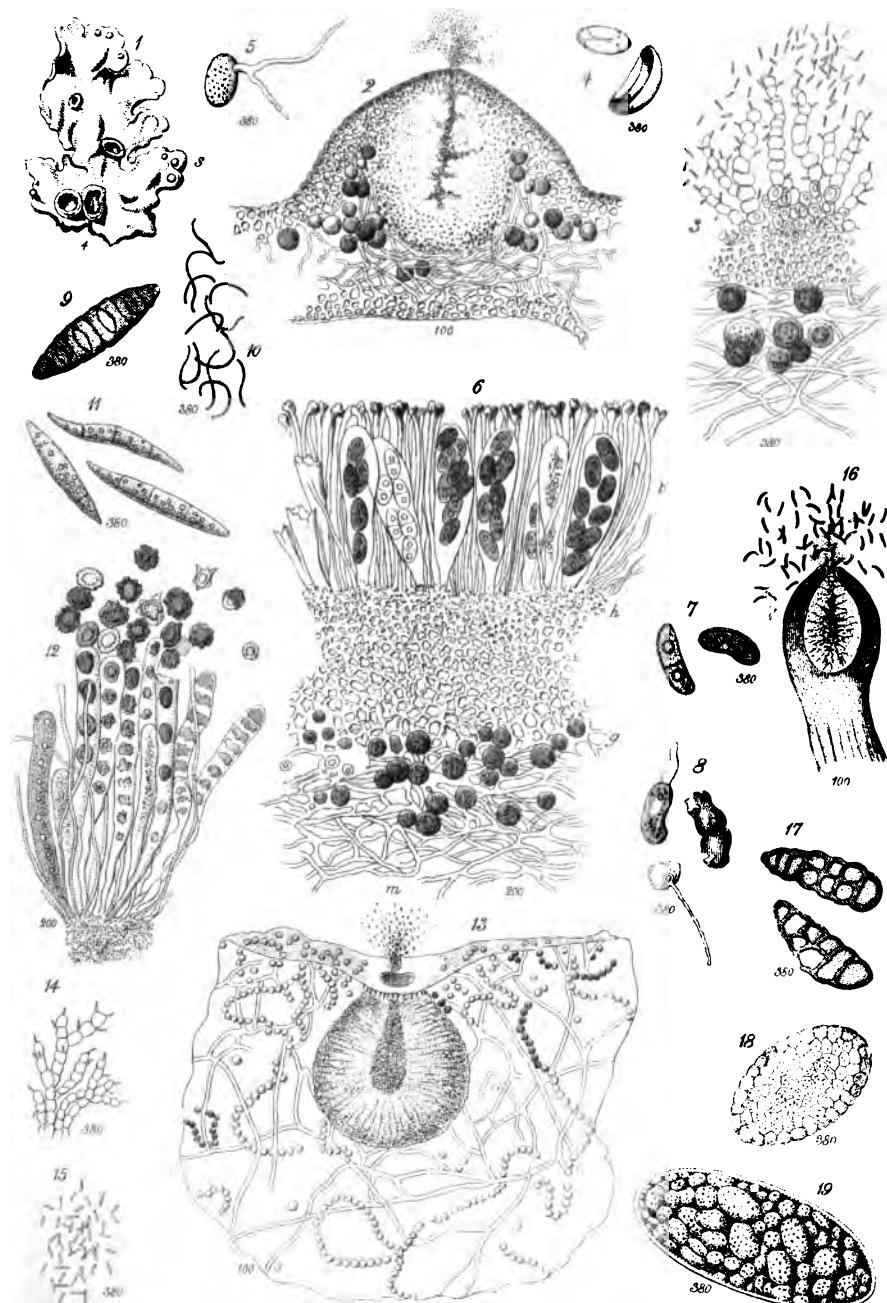




## PLATE 87.—Lichens.

### Figure

1. Fragment of the thallus of *Parmelia (Physcia) parietina*, Ach., with young apothecia, and spermogonia, *s*, near the edges of the lobes.
2. Vertical section of one of the spermogonia and the part of the thallus in which it lies. This section shows the upper and lower cortical layers of the thallus, with the intermediate filamentous medulla and its globular gonidia.
3. Fragment from the wall of the above spermogonium, more magnified to show the articulated filaments (*spermatophores*) which bear the spermatia.
4. Spores of the same, treated with iodine; the dark portion represents the protoplasmic contents.
5. A spore which has germinated.
6. Fragment of a vertical section through the apothecium of *Parmelia (Physcia) stellaris*, Fr. The upper part is the fertile layer, or thalamium, *b*, composed of thecae with spores, and paraphyses; this rests on the hypothecium, *h*, beneath which is a portion of the medullary layer, with gonidia, *g*.
7. Ripe spores of the same.
8. Ripe spores, germinated and not germinated, treated with sulphuric acid, and broken, showing the clear endospore inside the hard exospore.
9. Ripe spore of *Verrucaria nitida*, Fr.
10. Isolated spermatia from the spermogonia of ditto.
11. Ripe spores of *Peltigera horizontalis*, Hoffm.
12. Fragment of the thalamium of *Sphaerophoron coralloides*, Pers., with thecae in different stages of development, and free ripe spores.
13. Vertical section of a spermogonium of *Collema melanum (Jacobaeifolium)*, with spermatia escaping. Imbedded in the thallus are the moniliform gonidial filaments.
14. Isolated articulated filaments from the same.
15. Isolated spermatia from these filaments.
16. Vertical section of a spermogonium of *Cladonia rangiferina*, Hoffm., with spermatia escaping from its orifice.
17. Ripe spores of *Urzularia scruposa*, Ach., seen in water.
18. Fully developed spores of *Umbilicaria pustulata*, Hoffm.
19. Ripe spores of *Lecanora parella*, Ach.



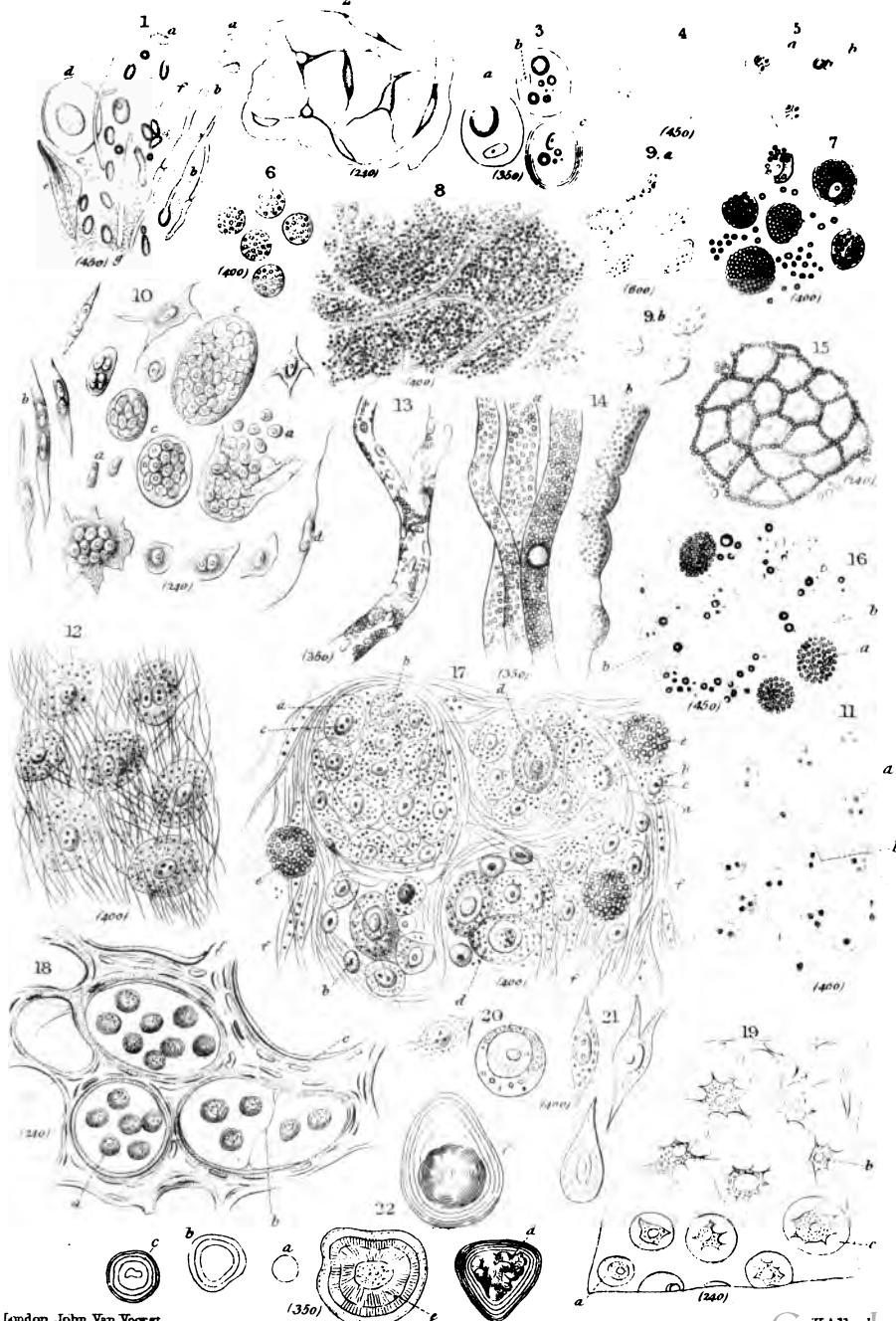




## PLATE 38.—**Morbid products, human.**

### **Figure**

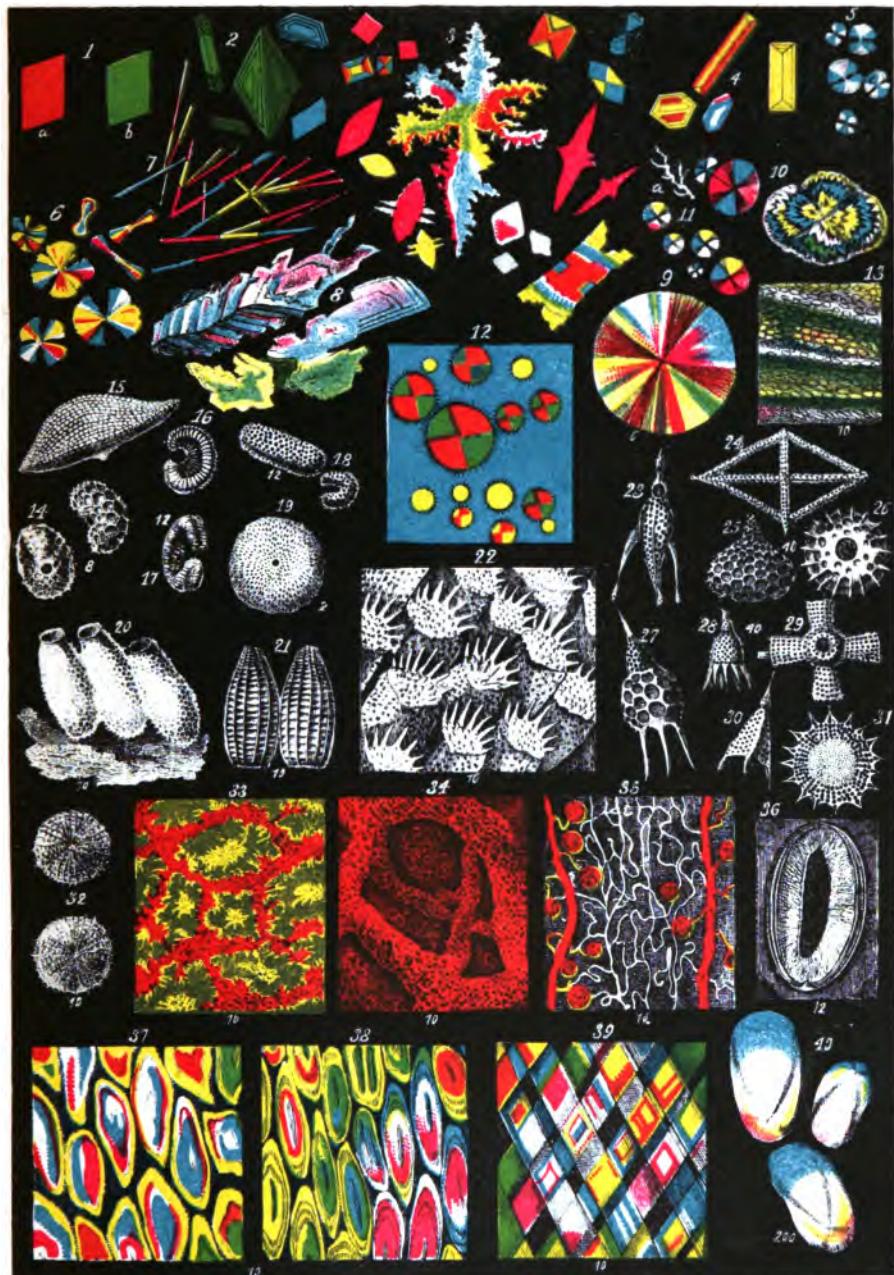
1. Aphtha. *a*, spores of fungus (*Oidium albicans*) ; *b*, fibres ; *c* and *f*, *Bacterium termo* ; *d*, *e*, epithelial scales ; *g*, early state of *Bacterium*.
2. Areolar tissue, with formative cells and homogeneous basis ; from a fibroid tumour of the upper jaw.
3. Cells of fatty tissue in degeneration. *a*, fat ; *b*, nucleus ; *c*, cell with thickened walls.
4. Corpuscles of pus.
5. Corpuscles of pus, treated with acetic acid. *a*, nuclei with object-glass slightly raised ; *b*, the same when this is depressed.
6. Pyoid corpuscles, of Lebert.
7. Granule-cells and loose fat-globules, some of the former with distinct cell-wall and nucleus ; in the lowest these are absent : from a cutaneous cancer.
8. Tuberole in lung, showing pulmonary fibres, tubercle-corpuscles, and fat-granules.
9. Tuberole-corpuscles, more magnified. *a*, seen in water ; *b*, treated with acetic acid.
10. Fibroplastic cells from a sarcomatous tumour of the thigh. *a*, loose secondary cells ; *b*, fusiform cells ; *c*, parent cells ; *d*, cell forming fibres.
11. Cancerous tissue from a medullary cancer, containing but few and pale fibres. *a*, free nucleus ; *b*, nucleus within a cell.
12. Cancerous tissue from a scirrrous cancer ; the fibres numerous, but delicate and not arranged in bundles.
13. Capillary vessel in a state of fatty degeneration, showing the oblong nuclei, and the minute fat-globules in the substance of the wall of the vessel.
14. *a*, fatty degeneration of the muscular bundles of the heart ; the transverse striae are absent, and globules of fat are disseminated through the substance. *b*, from muscle of the thigh, showing collapse of sarcolemma and partial absorption of muscular substance, with globules of fat in the remainder.
15. Intercellular fatty degeneration of encysted cutaneous tumour (cholesteatoma).
16. Tissue of medullary cancer of ovary. *a*, granule-cells ; *b*, cancer-cells ; the fibres are very few and slender.
17. Tissue of cancer of the oesophagus. *a*, cancer-cells ; *b*, their nuclei (secondary cells) ; *c*, nucleoli (tertiary cells) ; *d*, cancer-cells with highly developed nuclei ; *e*, granule-cells ; *f*, fibres and fusiform cells.
18. Colloid or alveolar cancer of the peritoneum. *a*, nuclei or secondary cells, the walls of the two parent cells are seen at *b* ; *c*, nuclei of areolar tissue ; the contents of the cells are of gelatinous consistence.
19. Portion of an enchondroma, showing cells imbedded in a homogeneous basis. *a*, cell with nucleus (secondary cell) and nucleolus (tertiary cell) ; *c*, secondary cell with processes ; *b*, secondary cell from which the primary has disappeared.
20. } Cancer-cells from medullary cancer.
21. } Cancer-cells from medullary cancer.
22. Colloid corpuscles. *a*, simple ; *b*, *c*, concentric or laminated corpuscles from hypertrophied heart ; *d*, *f*, laminated corpuscles from the prostate, containing calcareous matter ; *e*, concentric corpuscle from a cyst in an atrophied kidney.















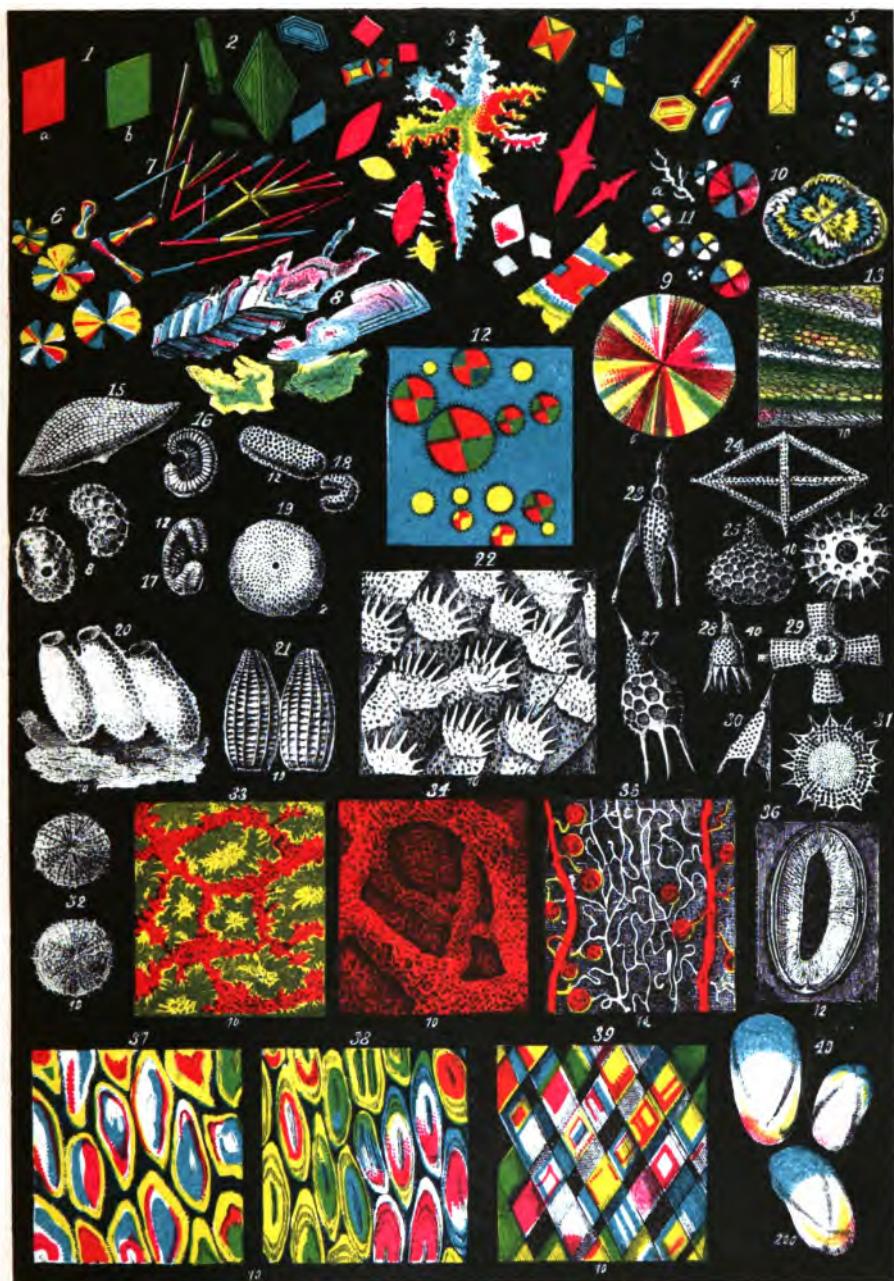
## PLATE 39.—Opaque and Polarizing Objects.

### Figure

1. Two rhombs of selenite as seen under different relative positions of the polarizer and analyzer.
2. Crystals of acetate of copper (ACETIC ACID, DICHROISM).
3. Crystals of uric acid under polarized light, natural and artificial (compare Pl. 12).
4. Prisms of ammonio-phosphate of magnesia, under polarized light.
5. Ellipsoidal-constricted, or dumb-bell crystals of oxalate of lime, under polarized light.
6. Crystals of oxalate of soda, under polarized light.
7. Crystals of oxalate of ammonia, under polarized light.
8. Crystals of oxalate of chromium and ammonia, under polarized light.
9. Crystals of salicine, under polarized light.
10. Crystals of sulphate of cadmium, under polarized light.
11. Crystals of oxalurate of ammonia, under polarized light.
12. Crystals of oxalurate of ammonia, under polarized light with a plate of selenite.
13. Elytrum of *Curculio imperialis*, as an opaque object.
14. Seed of white poppy (*Papaver somniferum*), opaque object.
15. Seed of sweet-william (*Dianthus barbatus*), opaque object.
16. } Seeds of *Silene gallica*, opaque objects.
17. } Seeds of *Silene gallica*, opaque objects.
18. Seeds of foxglove (*Digitalis purpurea*), opaque objects.
19. Egg of puss-moth (*Cerura vinula*), opaque object.
20. Eggs of bug (*Cimex lectularius*), opaque objects ; the lids are removed.
21. Eggs of *Pontia rapa*, opaque objects.
22. Skin and scales of sole (*Solea vulgaris*), opaque objects.
23. *Rhopalocanum ornatum*.
24. *Stephanastrum rhombus*.
25. *Eucertydium ampulla*, front view.
26. *Eucertydium ampulla*, under view.
27. *Podocyrtis Schomburgkii*.
28. *Anthocyrtis mespilus*.
29. *Astromma Aristotelis*.
30. *Lychnocanium lucerna*.
31. *Haliomma Humboldti*.
32. Eggs of *Pontia brassice*, opaque objects.
33. Portion of liver of cat ; the porta injected with red, the vena cava with yellow ; opaque object.
34. Portion of lung of toad ; opaque object.
35. Kidney of pig ; arteries and Malpighian bodies red, urinary tubules white ; opaque object.
36. Spiracle of *Bombyx*, opaque object.
37. } Sections of Rhinoceros-horn, by polarized light.
38. } Sections of Rhinoceros-horn, by polarized light.
39. White hairs of horse, interlaced ; by polarized light.
40. Tous-les-mois starch, by polarized light with plate of selenite.









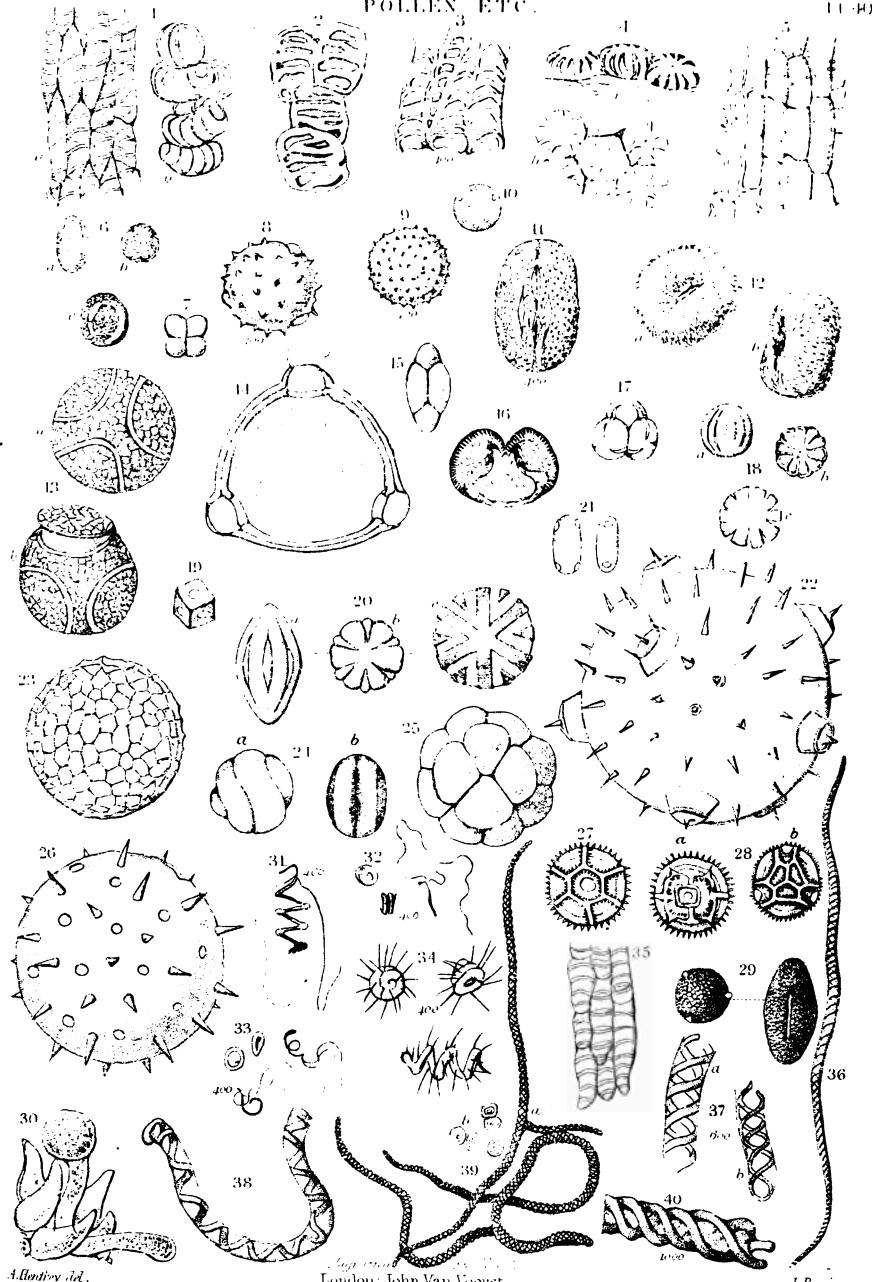


## PLATE 40.—Pollen, etc.

### Figure

1. *a* and *b*, spiral tissue of lining of anther from wallflower (*Cheiranthus cheiri*).
2. Ditto, from London Pride (*Saxifraga umbrosa*).
3. Ditto, from *Lupinus nanus*.
4. Ditto, from a cactus (*Cereus speciosus*). *a*, side view; *b*, from above.
5. Ditto, from daisy (*Bellis perennis*).
6. Pollen of *Viola odorata*. *a*, side view; *b*, end view; *c*, in water.
7. Pollen of *Apocynum venetum*.
8. Pollen of daisy (*Bellis perennis*).
9. Pollen of *Mesembryanthemum*.
10. Pollen of *Alisma plantago*.
11. Pollen of *Lupinus nanus*.
12. Pollen of garden-geranium (*Pelargonium speciosum*). *a*, front view; *b*, side view.
13. Pollen of passion-flower (*Passiflora caerulea*). *a*, perfect grain; *b*, grain with the lid of a pore opening.
14. Pollen of *Epilobium montanum*.
15. Pollen of *Periploca graeca*.
16. Pollen of *Pinus sylvestris*.
17. Pollen of *Erica multiflora*.
18. Pollen of *Sherardia arvensis*. *a*, side view; *b*, end view; *c*, ditto in water.
19. Pollen of *Basella alba*.
20. Pollen of *Passiflora quadrangularis*. *a*, side view; *b*, end view; *c*, ditto in water.
21. Pollen of *Impatiens noli-me-tangere*.
22. Pollen of *Cucurbita pepo*, in water.
23. Pollen of *Ruellia formosa*.
24. Pollen of *Thunbergia alata*, *a*; of *Mimulus moschatus*, the musk-plant, *b*.
25. Compound pollen of *Acacia lata*.
26. Pollen of *Hibiscus trionum*.
27. Pollen of chicory (*Cichorium Intybus*).
28. Pollen of *Sonchus palustris*, side and end views.
29. Pollen of *Statice linifolia*, end and side views.
30. Pollen-grain with tube upon the stigmatic papillæ, from *Lathraea squamaria*.
31. Spermatozoid from the globule of *Chara fragilis*.
32. Spermatozoids from the antheridium of *Marchantia polymorpha*.
33. Spermatozoids from the antheridium of *Polytrichum commune*.
34. Spermatozoids from the antheridium of a Fern (*Gymnogramma*).
35. Spiral-fibrous cells of the sporangium of *Marchantia polymorpha*.
36. Elater of *Marchantia polymorpha*.
37. Fragments of ditto. *a*, from the middle; *b*, one end.
38. Elater of *Frullania dilatata*.
39. Elaters (*a*) and spores (*b*) of *Trichia*.
40. Fragment of the same elater showing the three internal spiral fibres.

POLLEN, ETC.



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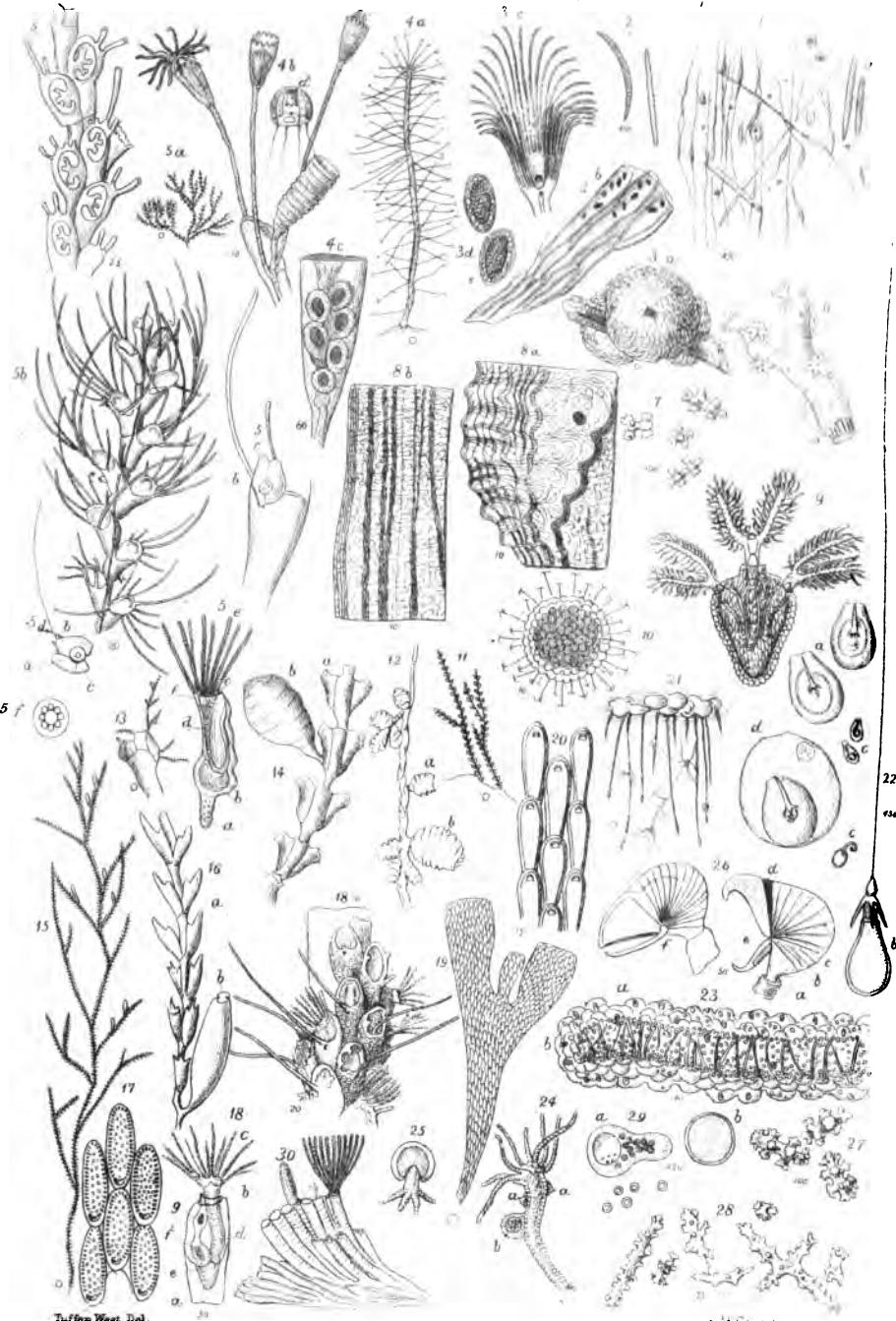




## PLATE 41.—Polypi and Polyoza.

### Figure

1. Areolar tissue of sea-anemone (*Actinia mesembryanthemum*); with spicula, cells, and fibre-cells.
2. Spicula from the same.
3. *Aleyonella stagnorum*. *a*, entire polyozy; *b*, perpendicular section, showing tubes and ova; *c*, back view of polype with tentacles; *d*, ova.
4. *Campanularia volubilis*. *a*, growing upon a piece of *Plumularia falcata*; *b*, portion of polypidom more magnified; *c*, cell of *Laomedea dichotoma* with ova; *d*, medusa-germ or gonozoid of *Clytia*.
5. *Canda (Cellularia) reptans*, portion of polypidom of. *5 a*, *Bicellaria (Cellularia) ciliata*; *5 b*, the same more magnified, \* a bird's-head process; *5 c*, posterior view of a cell of *Canda reptans*, with its appendices; *5 d*, three appendices to a cell of the same; *5 e*, polype expanded; *5 f*, perforated septum.
6. *Corallium rubrum*; axis with polypiferous crust.
7. Spicula from the crust.
8. *a*, transverse section of the axis of red coral, from the furrowed exterior towards the centre; *b*, longitudinal section.
9. Body of *Cristatella mucedo*.
10. Ova of the same, seen from above.
11. Branch of *Sertularia rugosa*.
12. Portion of the same, magnified, with cells *a*, and vesicles *b*.
13. *Sertularia pumila*.
14. Portion of the same, magnified. *a*, cell; *b*, vesicle.
15. *Sertularia operculata*.
16. Portion of the same, magnified. *a*, cells; *b*, vesicles.
17. *Lepralia variolosa*.
18. *Membranipora pilosa*. *18\**, polypes protruding from the cells; *18 a*, cell; *b*, valve through which the ciliated tentacles *c* protrude; *d*, oesophagus; *e*, pouch containing the stomach, liver, &c.; *f*, place of gyration of particles in intestine; *g*, rectum.
19. Piece of *Flustra carbarea*.
20. Cells of the same, magnified.
21. *Hydra viridis*, attached to *Lemna*.
22. Stinging organs of *Hydra vulgaris*. *a*, capsule with the spines and filament enclosed; *b*, capsule with the spines and filament protruded; *c*, very minute capsules; *d*, capsule imbedded in a globule of the sarcodic substance of the body.
23. Tentacle of *Hydra viridis*. *a*, stinging organs *in situ*.
24. *Hydra viridis*, with spermatic capsules *a*, and ovarian capsule *b*.
25. Ovum of *Hydra*, with the young polype bursting through its shell.
26. Bird's-head processes of *Flustra avicularis*.
27. Spiculum of a *Gorgonia*.
28. Spicula of *Aleyonium digitatum*.
29. Globules of sarcodic substance of a crushed *Hydra viridis*. *a*, one containing a small vacuole and several green granules; the latter are more magnified below; *b*, a globule greatly distended by the formation of a large vacuole.
30. *Tubulipora*, with a polype protruding from a cell.







## PLATE 42.—Rocks.

### Figure

1. Fluid-lacunæ in quartz, magnified 120 diameters.
2. Glass-lacunæ in triclinic felspar. Lava of A.D. 1807; near Randazzo, Etna; 77 diams. *Crossed Nicols.*
3. Trichites in obsidian. Yellowstone district, U. S., 250 diams.
4. Crystallites in obsidian. Mexico, 30 diams.
5. Microliths (belonites) of augite, in pitchstone. Corriegills, Arran, 55 diams.
6. Spherules in obsidian. Lipari, 25 diams.
7. Perlite. Buschbad, near Meissen, Saxony, 18 diams.
8. Fluxion structure around sanidine crystals in obsidian. Lower Geyser basin, Yellowstone district, Colorado, U. S., 18 diams.
9. Granite. Cornwall, 25 diams. *Polarized light.* (Orthoclase, plagioclastic felspar, quartz, and biolite.)
10. Syenite. Hembsbach, Germany, 30 diams. *Polarizer only.* (Hornblende, orthoclase, quartz, and magnetite.)
11. Minette (mica trap). Seifersdorf, Saxony, 55 diams.
12. Felstone (hällefinta). Schieeshyttan, Sweden, 120 diams. *Crossed Nicols.*
13. Trachyte. Drachenfels, Rhine, 55 diams. *Polarized light.* (Sanidine, oligoclase sphene, &c.)
14. Phonolite. Höhgau, Germany, 33 diams. (Nosean and hornblende.)
15. Diorite. Ontario, 55 diams. *Polarized light.* (Hornblende, triclinic felspar, apatite, &c.)
16. Basalt. Wohlbach, near Adorf, Saxony, 18 diams. *Polarized light.* (Porphyritic olivine crystals and magnetite.)
17. Basalt. Giant's Causeway, Ireland, 77 diams. *Polarized light.* (Olivine, triclinic felspar, magnetite.)
18. Basalt. Titterstone, Clee Hill, Shropshire, 77 diams. *Polarized light.* (Augite, triclinic felspar, apatite, &c.)
19. Phonolite. Wolf Rock, Cornish coast, 33 diams. (Nepheline and hornblende.)
20. Mica schist. Bräunsdorf, Saxony, 18 diams. (Biolite and quartz.)
21. Millstone grit (coarse felspathic sandstone). Black Rocks, Cromford, Derbyshire, 18 diams. *Polarized light.* (Fragments of quartz and felspar, with ferruginous cement.)
22. Slate (Cambrian). Penrhyn Quarries, North Wales, 250 diams. *Crossed Nicols.*
23. Great Oolite. Grimsthorpe Park, Lincolnshire, 18 diams.
24. Carrara marble, 33 diams. *Polarized light.*

The minerals mentioned, in brackets, form prominent objects in the drawings; but do not necessarily include all the constituents of the different rocks.



Frank Putley del.

London: John Van Voorst.

H. Adlard, sc.

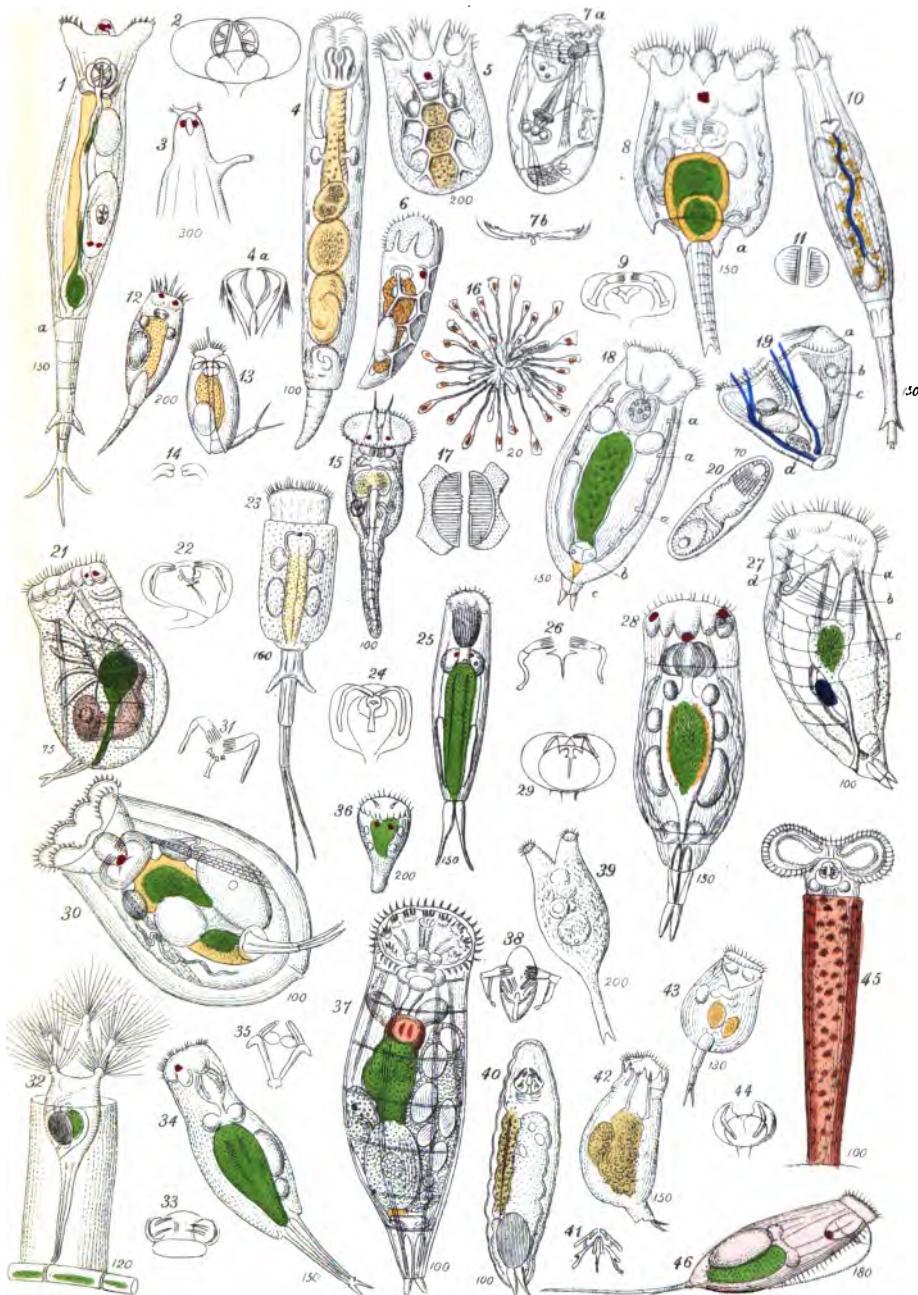




## PLATE 43.—*Rotatoria.*

### Figure

1. *Actinurus Neptunius*, E., swimming. *a*, orifice of intestine.
2. Gizzard, with teeth of the same.
3. Head of the same, while crawling.
4. *Albertia vermiculus*, D. ; 4 *a*, teeth.
5. *Anuraea curvicornis*, E., dorsal view.
6. *Anuraea curvicornis*, E., half side view.
7. *Applanchna priodonta* ; *b*, jaws and teeth.
8. *Brachionus amphiceros*.
9. *Brachionus rubens*, jaws of.
10. *Callidina elegans*.
11. *Callidina elegans*, jaws.
12. *Colurus deflexus*, dorsal view.
13. *Colurus deflexus*, under view.
14. *Colurus deflexus*, teeth.
15. *Conochilus volvox*, isolated animal.
16. *Conochilus volvox*, spherical group.
17. *Conochilus volvox*, jaws of.
18. *Cycloglena lupus*. *a*, tremulous bodies ; *b*, contractile sac.
19. *Cyphonautes compressus*, side view. *a*, pharynx ; *b*, nervous ganglion ; *d*, intestine.
20. *Cyphonautes compressus*, end view.
21. *Diglena lacustris*.
22. *Diglena lacustris*, jaws.
23. *Dinocharis tetractis*.
24. *Dinocharis pocillum*, teeth of.
25. *Distemma forcicula*.
26. *Distemma forcicula*, jaws of.
27. *Enteroplea hydatina*.
28. *Eosphora digitata*.
29. *Eosphora digitata*, jaws of.
30. *Euchlanis triquetra*.
31. *Euchlanis triquetra*, jaws of.
32. *Flocularia ornata*.
33. *Floacularia proboscidea*, jaws of.
34. *Furcularia Reinhardtii*.
35. *Furcularia Reinhardtii*, jaws of.
36. *Glenophora trochus*.
37. *Hydatina senta*.
38. *Hydatina senta*, jaws of.
39. *Hydrius cornigera*.
40. *Lindia torulosa*.
41. *Lindia torulosa*, teeth of.
42. *Plagiognatha hyptopus*, D. (*Notommata hyp.*, E.).
43. *Lepadella emarginata*.
44. *Lepadella ovalis*, jaws of.
45. *Linnias ceratophylli*.
46. *Mastigocerca carinata*.



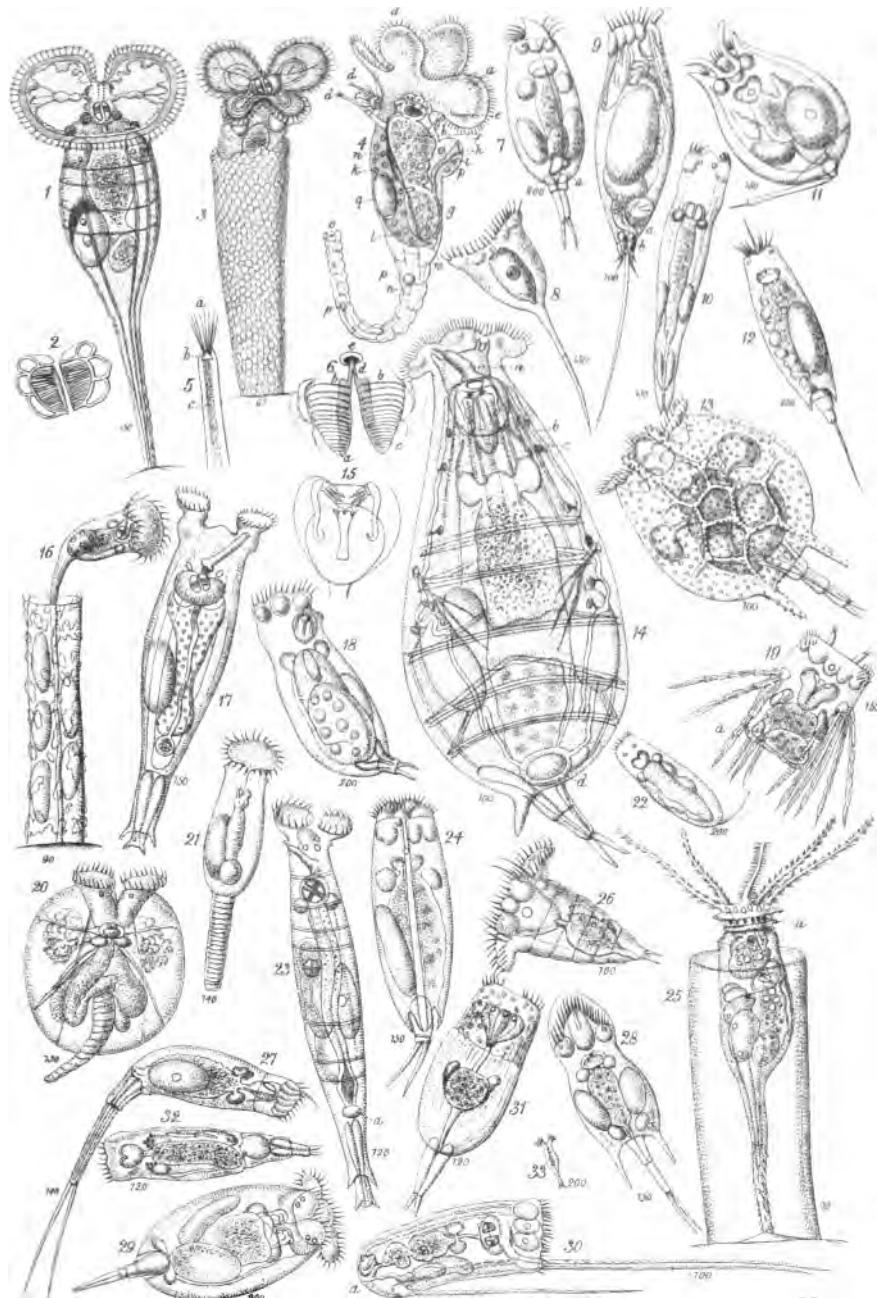




## PLATE 44.—*Rotatoria.*

### Figure

1. *Megalotrocha flavicans.*
2. *Megalotrocha flavicans*, jaws.
3. *Melicerta ringens.*
4. *Melicerta ringens*, removed from its sheath. *a*, rotatory lobes; *b*, lips; *c*, accessory ciliated lobe; *d*, tentacular processes; *e*, pharynx or cesophagus and jaws; *f*, *g*, upper and lower stomach; *h*, anus; *k*, ovary; *l*, oviduct; *m*, spermatic organ; *n*, tail; *o*, disk; *p*, sarcodic globules; *q*, ovum.
5. *Melicerta ringens*, tentacular process of. *a*, setæ; *b*, conical body; *c*, muscle.
6. *Melicerta ringens*, jaws of.
7. *Metopidia triptera*. *a*, contractile sac.
8. *Microcodon clavus.*
9. *Monocerca rattus*. *a*, contractile sac; *b*, muscle.
10. *Monolabis gracilis.*
11. *Monostyla quadridentata.*
12. *Monura dulcis.*
13. *Noteus quadricornis.*
14. *Notommata centrura.*
15. *Notommata centrura*, jaws of.
16. *Œcistes crystallinus.*
17. *Philodina erythrophthalma.*
18. *Pleurotrocha gibba.*
19. *Polyarthra platyptera.*
20. *Pterodina patina.*
21. *Ptygura melicorta.*
22. *Rattulus lunaris.*
23. *Rotifer vulgaris*. *a*, contractile sac.
24. *Salpina redunca*, dorsal view.
25. *Stephanoceros Eichhornii*. *a*, tremulous bodies.
26. *Synchaeta baltica.*
27. *Scaridium longicaudum.*
28. *Stephanops cirratus.*
29. *Squamella oblonga.*
30. *Triarthra longiseta.*
31. *Triophthalmus dorsalis.*
32. *Theorus vernalis.*
33. *Typhlina viridis.*







## PLATE 45.—Shell, etc.

### Figure

1. Calcareous corpuscles of common starfish (*Asterias (Uraster) rubens*), *a, b, c, d, e* ; *f*, the same from an *Ophura*; *g*, calcareous disk from an *Echinus*; *h, i, k, l, m*, from an *Ophura* (ECHINODERMATA).
- 2\*. Spine of an *Ophura*; *2*, portion of the same more magnified.
3. A pedicellaria of the common starfish (*Asterias rubens*); on the right hand is a portion of the margin more magnified to show the teeth.
4. Shell of *Pinna*, section parallel to the surface.
5. Shell of *Pinna*, section perpendicular to the surface.
6. Spine of an *Echinus*, transverse section. *6a*, segment of the same, more magnified.
7. Section of shell of a *Terebratula*; *a* perpendicular to, *b* parallel with, the surface.
8. Portion of a sponge, with the spicula projecting from its surface.
9. Shell of oyster. *a, b*, sections parallel to surface.
10. Shell of oyster, showing the rhomboidal crystals of carbonate of lime.
11. Shell of oyster, showing the cellular appearance; *a*, parallel with, *b*, perpendicular to, the surface.
12. Shell of hen's egg, from a "soft" egg.
13. Shell of hen's egg, perfectly formed.
14. Shell of egg of ostrich, section parallel to surface.
15. Shell of egg of ostrich, section perpendicular to surface.
16. Shell of lobster, section perpendicular to surface.
19. Anchor-shaped spicular hooks of *Synapta* (ECHINODERMATA).  
The remaining figures represent the spicula of sponges.
- a*. Elongato-fusiform, tubercular.
- b*. Acicular, acute at both ends.
- b\**. Subulato-acicular, base trifid, rays shortly bifid.
- c*. Subulato-acicular.
- d*. Subulato-acicular, base swollen.
- e*. Arcuato-acicular, acute at both ends.
- f*. Shortly cylindrical, ends doubly trifid.
- g*. Subulato-acicular, base turbinated.
- h*. Subulato-acicular, base capitate.
- i*. Subulato-fusiform.
- k*. Elongato-subulate, base capitate.
- l*. Terete, geniculate.
- m*. Filiform, ends capitate.
- n*. Acicular, ends bifurcate.
- o*. Acicular, ends trifurcate.
- p*. Subulato-acicular, base triradiate.
- q*. Acicular, base tri-retrocuspid.
- r*. Uncinato-filiform.
- s*. Bacilliform, ends tri-retrocuspid.
- t*. Arcuate, ends uncinate.
- u*. Stellato-triradiate.
- v*. Geminate, arms subulato-filiform, geniculate.
- w*. Stellato-quadriradiate.
- x*. Stellato-quinqueradiate.
- y*. Stellato-multiradiate, ends capitate.
- a*. Subulate tuberculate.
- β*. Arcuate spinulose, ends clavate.
- γ*. Stellate inaequiradiate.
- δ*. Bacilliform spinulose, with dentate, discoid, rotate ends.
- ε*. Globular, with subulate spines.
- ζ*. Oblong, with irregularly stellate ends, the rays capitate; *\*,* side view.
- η*. Bacilliform, with stellate rotate ends.

SHELL &c.





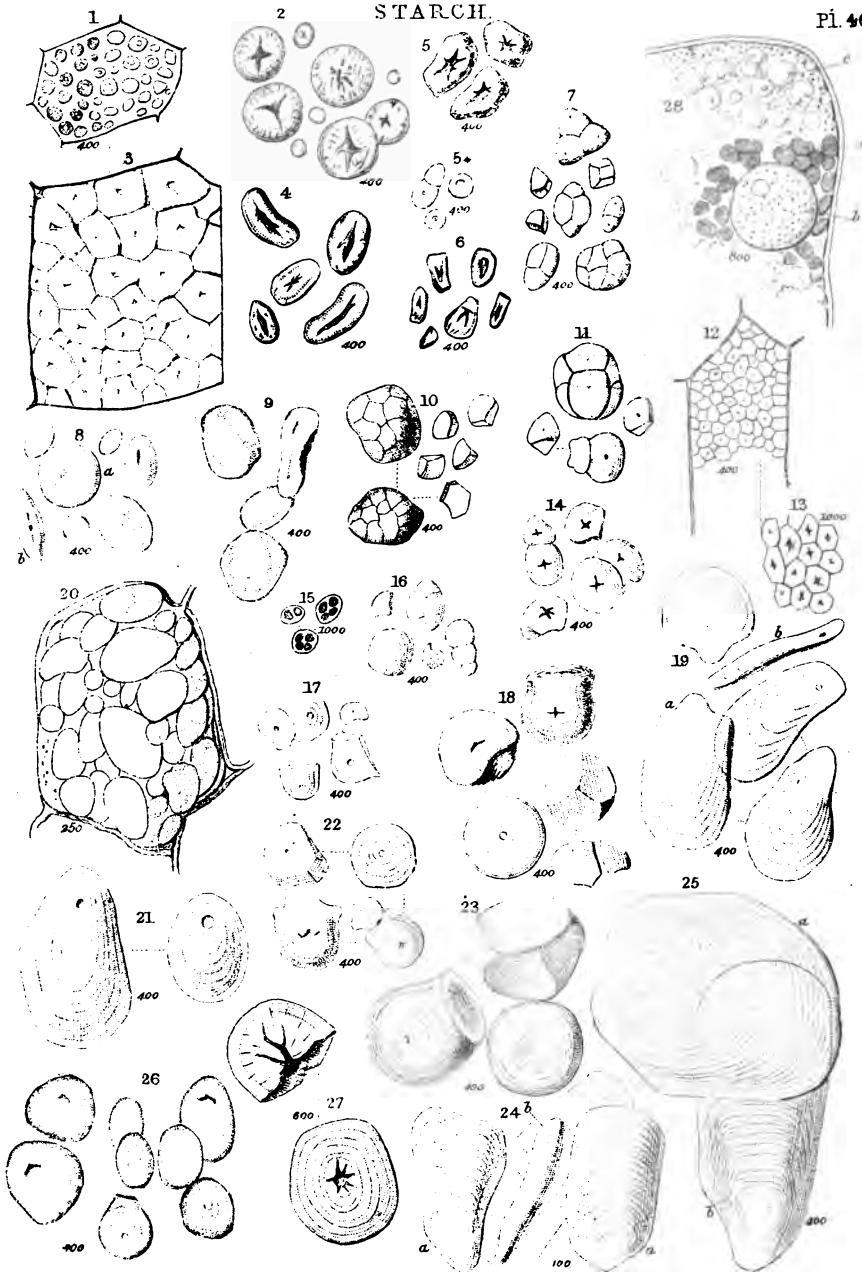


## PLATE 46.—Starch.

### Figure

1. Section of a cell of the albumen of a young maize-seed, showing the nascent starch-grains imbedded in protoplasm.
2. Starch-grains of rye, with a stellate hilum.
3. Section of a cell from the outer horny part of the albumen of maize; the starch-grains completely fill the cell, and by their crowded condition have compressed each other into polygonal forms; the hilum is visible.
4. Starch-grains of bean.
5. Free starch-grains of maize from the cells of the centre of the seed; 5\*, young starch-grains of ditto.
6. Starch-grains of orris-root; used to adulterate snuff.
7. Compound starch-grains and separated granules, from the corm of the crocus.
8. Lenticular starch-grains of wheat. *a*, seen in face; *b*, seen edgewise.
9. Discoid starch-grains of barley. *aa*, front view; *b*, edgewise.
10. Compound starch-grains and separated granules of oats.
11. Compound grains and separated granules of Portland arrowroot (*Arum maculatum*).
12. Part of a section of a cell of the grain of rice, exhibiting very minute starch-grains, firmly compacted as in maize.
13. A portion of the same, more magnified.
14. Starch-grains of Cassava (*Jatropha Manihot*)\*. Tapioca.
15. Young starch-grains from the cells of the prothallium of a fern (*Gymnogramma*).
16. Compound starch-grains and separated granules of the bread-fruit (*Artocarpus incisa*)\*.
17. Starch-grains of *Cycas circinalis*.\*
18. Starch-grains of arrowroot from Singapore\*.
19. Starch-grains of an East-Indian arrowroot obtained from a species of *Curcuma*\*.
20. Cell of a potato, showing the loosely-packed starch-grains.
21. Isolated starch-grains of the potato.
22. Starch-grains of *Tacca pinnatifida*, from Tahiti\*.
23. Starch-grains of sago (from a *Sagus*?)\*.
24. Starch from plantain-meal (*Musa*). *a*, front view; *b*, edgewise\*.
25. Starch of *Tous-les-mois* (*Canna*). *a*, front view; *b*, edgewise\*.
26. Starch-grains of true West-Indian arrowroot (*Maranta arundinacea*).
27. Isolated starch-grains from the cotyledon of a haricot bean.
28. Part of a cell of the stem of the white lily (*Lilium candidum*), showing nascent starch-grains: *a*, forming in cavities of the protoplasm, *c*; *b*, nucleus.

\* The figures to which the asterisk is appended were taken from specimens with which we were favoured from the Museum of Economic Botany at Kew.







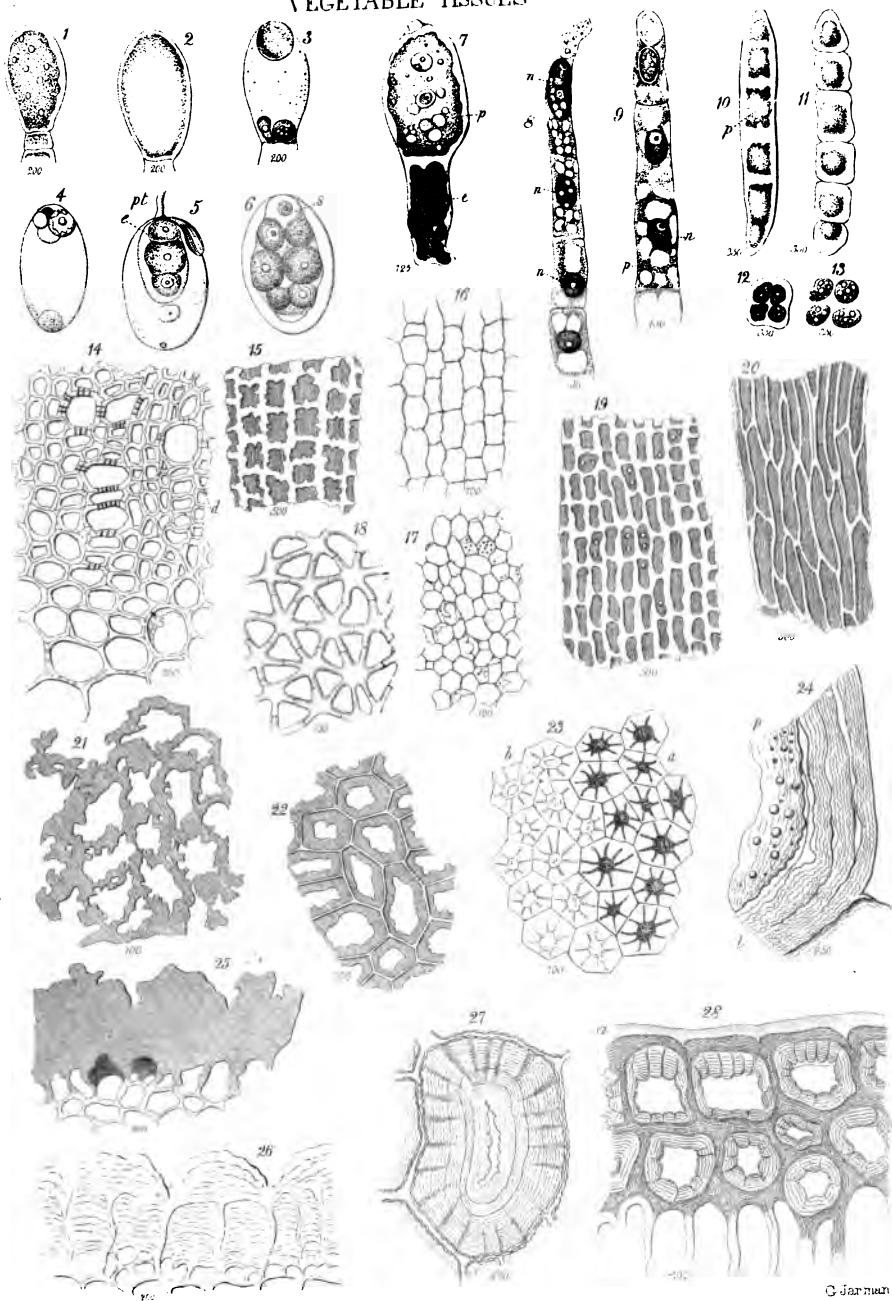
## PLATE 47.—Vegetable Tissues.

### Figure

1. Embryo-sac, and supporting cells, of *Orchis morio*.
2. The same, more advanced.
3. The same, with a germinal vesicle at its apex.
4. The same, with three germinal vesicles, just before impregnation.
5. The same, after the pollen-tube (*p t*) has reached it, one of the germinal vesicles (*e*) already being developed to form the embryo.
6. The same, more advanced, showing the first cell of the suspensor (*s*) at the upper end.
7. Embryo-sac of *Lathraea squamaria* before the origin of the germinal vesicles ; *p*, amorphous protoplasm ; *e*, protoplasm in course of development into endo-sperm-cells.
- 8, 9. Apices of very young hairs of the filaments of *Tradescantia virginica* ; *n*, *n*, nuclei, containing nucleoli ; *p*, protoplasm.
10. Cylindrical cell from which are formed the parent cells of the spores of *Marchantia polymorpha* ; *p*, primordial utricles of the parent cells.
11. The same, converted into a string of cells.
12. One of the parent cells isolated, with four primordial utricles of the spores.
13. The four spores free.
14. Transverse section of pith and internal wood of elder ; *d*, porous duct.
15. Epidermis of the leaf of the pine-apple, seen from above.
16. Vertical section of cork.
17. Transverse section of ditto.
18. Transverse section of stellate parenchyma of rush-pith.
19. Cellular tissue (parenchymatous) of the leaf of *Orthotrichum pulchellum*.
20. Cellular tissue (prosenchymatous) of the leaf of *Hypnum decipiens*.
21. Section of the albumen of the seed of *Areca Catechu*.
22. The same, after treatment with sulphuric acid and iodine.
23. Section of the bony albumen of vegetable ivory. *a*, cells and pits filled with air ; *b*, cells filled with Canada balsam.
24. Cell-membrane of *Hydrodictyon utriculatum*. *l*, the laminae of the cellulose coat ; *p*, protoplasm.
25. Vertical section of the epidermis of a mistletoe-branch several years old.
26. The same, after boiling in solution of potash and treatment with iodine.
27. Transverse section of a liber-cell of the oak, after long boiling in nitric acid and treatment with iodine.
28. Vertical section of the upper face of the leaf of *Cycas revoluta*. *a*, cuticle, extending over the epidermal cells, which, like the deeper-seated cells, have pitted secondary deposits.

VEGETABLE TISSUES

Pl. 47.



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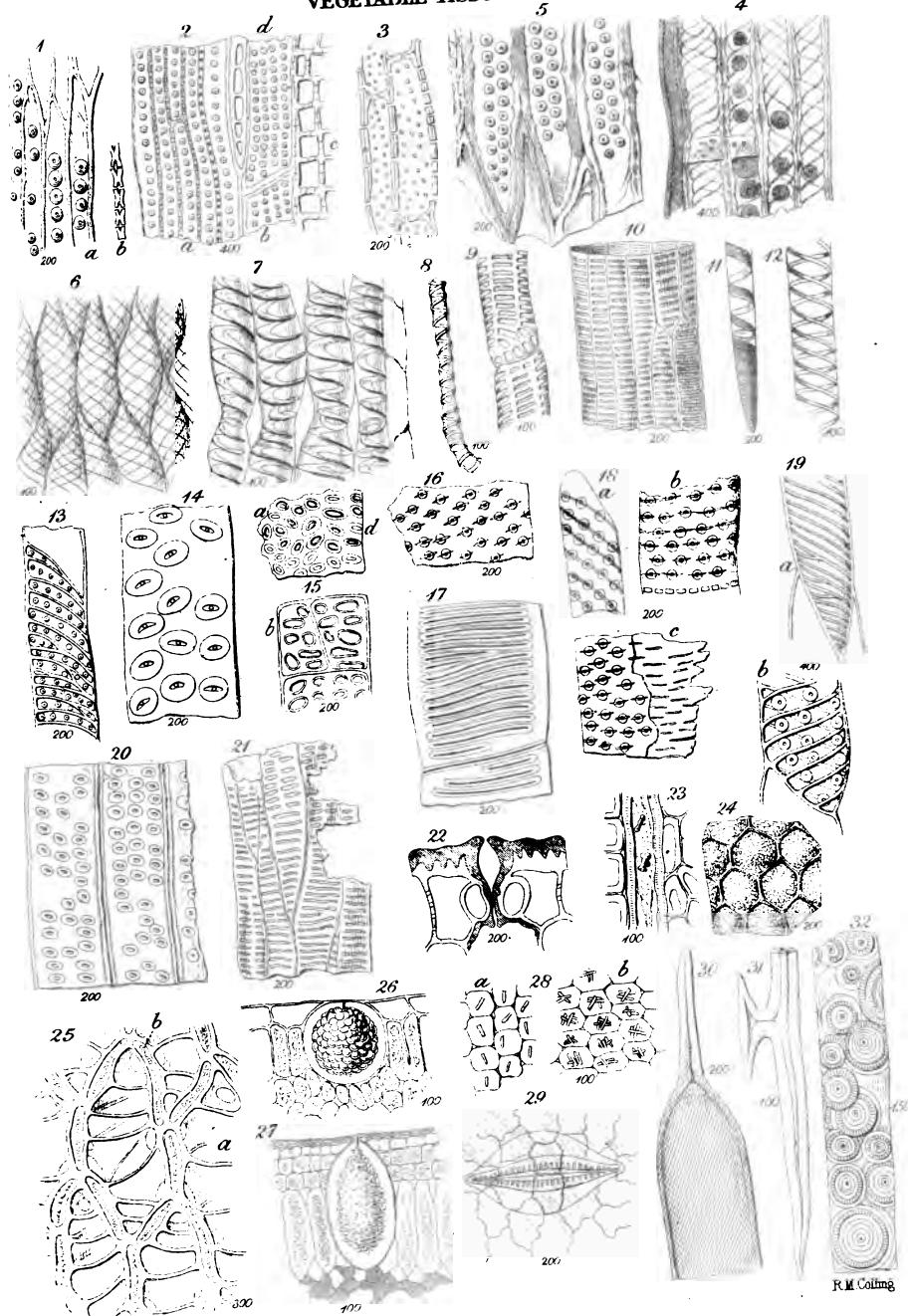


## PLATE 48.—Vegetable Tissues.

### Figure

1. Wood of *Pinus sylvestris*. *a*, radial vertical section; *b*, tangential section of the walls of two contiguous pitted wood-cells.
2. Tangential section of the wood of *Casuarina equisetifolia*. *a*, pitted wood-cells; *b*, duct; *c*, cells of a true medullary ray; *d*, cells of one of the concentric medullary layers.
3. Vertical section of wood-cells of box.
4. Vertical (radial) section of wood-cells of the yew.
5. Vertical (radial) section of wood-cells of *Araucaria imbricata*.
6. Spiral-fibrous cells from the roots of *Dendrobium alatum*.
7. Wood-cells of *Mammillaria*, with broad spiral bands.
8. Spiral and annular vessels of rhubarb.
9. Reticulated duct from the same.
10. Scalariform duct of a tree fern.
11. End of a spiral vessel of the white lily.
12. Fragment of a larger and looser one.
13. Pitted duct of the lime (*Tilia parvifolia*).
14. Wall of a pitted duct of *Caseyta glabella*.
15. Walls of pitted ducts of *Bombax pentandrum*. *a*, next another duct; *b*, next cells.
16. Wall of a pitted duct of *Laurus Sassafras*.
17. Wall of a pitted duct of *Chilianthus arboreus*.
18. Walls of pitted ducts of clematis (*Clematis Vitalba*).
19. End of a spiral-fibrous duct of *Daphne Mezereon*.
20. Walls of pitted wood-cells of *Cycas*.
21. Fragment of the wall of a large pitted duct of *Eryngium maritimum*.
22. Vertical section through a stoma of *Aloë ferox*; the darkly shaded part represents the cuticular layer.
23. Fragment of a latex-duct of *Euphorbia antiquorum*, the latex containing starch-grains of peculiar shape.
24. Epidermis of the petal of the daffodil, from above.
25. Fragment of the leaf of *Sphagnum cymbiforme*. *a*, empty cells with spiral fibre; *b*, interstitial cells with chlorophyll.
26. Vertical section of the upper face of the leaf of *Parietaria officinalis*, with a cystolith; magnified 100 diameters.
27. A similar section from the leaf of *Ficus elastica*; magnified 100 diameters.
28. *a* and *b*, sections of the cellular tissue of an onion-bulb, containing raphides.
29. Stomate and epidermis of *Equisetum*; the siliceous coat remaining after the destruction of the organic matter.
30. End of a liber-fibre of the periwinkle (*Vinca major*), with fine spiral striae.
31. Branched liber-cell of the radicle of *Rhizophora Mangle*.
32. Siliceous cast of the inside of a duct of unknown fossil wood; the peculiar concentric concretions of the silica imitate to a certain extent the so-called glandular markings of Coniferae.

## VEGETABLE TISSUES.







## PLATE 49.—Various Objects.

### Figure

1. Mixtures of oil and water (INTR. p. xxxvii). *a*, water in oil; *b, c*, oil in water.
2. *Oceania cruciata* (ACALEPHÆ), epidermis of.
3. *Oceania cruciata*. *a, b*, stinging-capsules with filament included; *c*, with filament expelled.
4. *Diphyes Kochii* (ACALEPHÆ); organs of adhesion upon tentacles.
5. *Oceania cruciata*, portion of margin of disk, slightly magnified. *a*, ovary; *b*, muscular bundles; *c*, transverse vessel coming from the stomach; *d*, marginal vessel; *e, f*, tentacular filaments; *g*, auditory organs. 5\*, spermatozoa.
6. Infusorial embryos of ACALEPHÆ.
- 7, 8, 9, 10. The same, further developed.
11. Strobile-segments; *a*, magnified; *b*, natural size.
12. Epidermis of *Triton cristatus* (water-newt).
13. Ciliated epithelium from frog's throat.
14. *Alderia apiculosa*.
15. *Alderia pyriformis*.
16. *Hæmocharis*, epidermis of.
17. *Hæmocharis*, transverse section of muscular fibres.
18. *Hæmocharis*, muscular fibre, showing the sarcolemma.
19. *Hæmocharis*, margin of cephalic disk, with branching muscular fibres *c*; and, *a, b, d*, glands and ducts.
20. *Aphrodita aculeata*, hair of, treated with potash.
21. Blood-corpuscles, human. *a, d*, surface view at different foci; *c*, side or edge view; *b*, colourless or lymph-corpuscle; *e*, coloured corpuscles altered, either spontaneously or by mixture with foreign matters, as urine, &c.; *f*, corpuscle changed by tannic acid.
22. Blood-corpuscles of the goat (*Capra hircus*).
23. " " whale (*Balaena*).
24. " " ostrich (*Struthio*).
25. " " pigeon (*Columba*).
26. " " stickleback (*Gasterosteus aculeatus*).
27. " " loach (*Cobitis fossilis*); *b*, colourless corpuscle.
28. " " frog (*Rana temporaria*); *b*, colourless corpuscle; *c, d*, the same altered by water.
29. " " triton (*Triton cristatus*); *b*, colourless corpuscle; *c, d, e, f*, altered coloured corpuscles.
30. " " Siren; *b*, colourless corpuscle.
31. " " crab (*Carcinus*).
32. " " spider (*Tegenaria domestica*).
33. " " cockroach (*Blatta orientalis*).
34. " " worm (*Lumbricus terrestris*). *a*, corpuscle partly drawn out, as occurs with the bodies of some Infusoria.
35. " " garden-snail (*Helix aspersa*).
36. " " human, coloured, undergoing division.
37. Blood, human, in coagulation; *b*, colourless corpuscle.
38. Cartilage of the ear of a mouse; the fat is partly removed from the cells.
39. Cartilage of human rib.
40. Cartilage of human epiglottis.
41. Connective tissue, human, with fat-cells.
42. Formation of connective tissue from cells.



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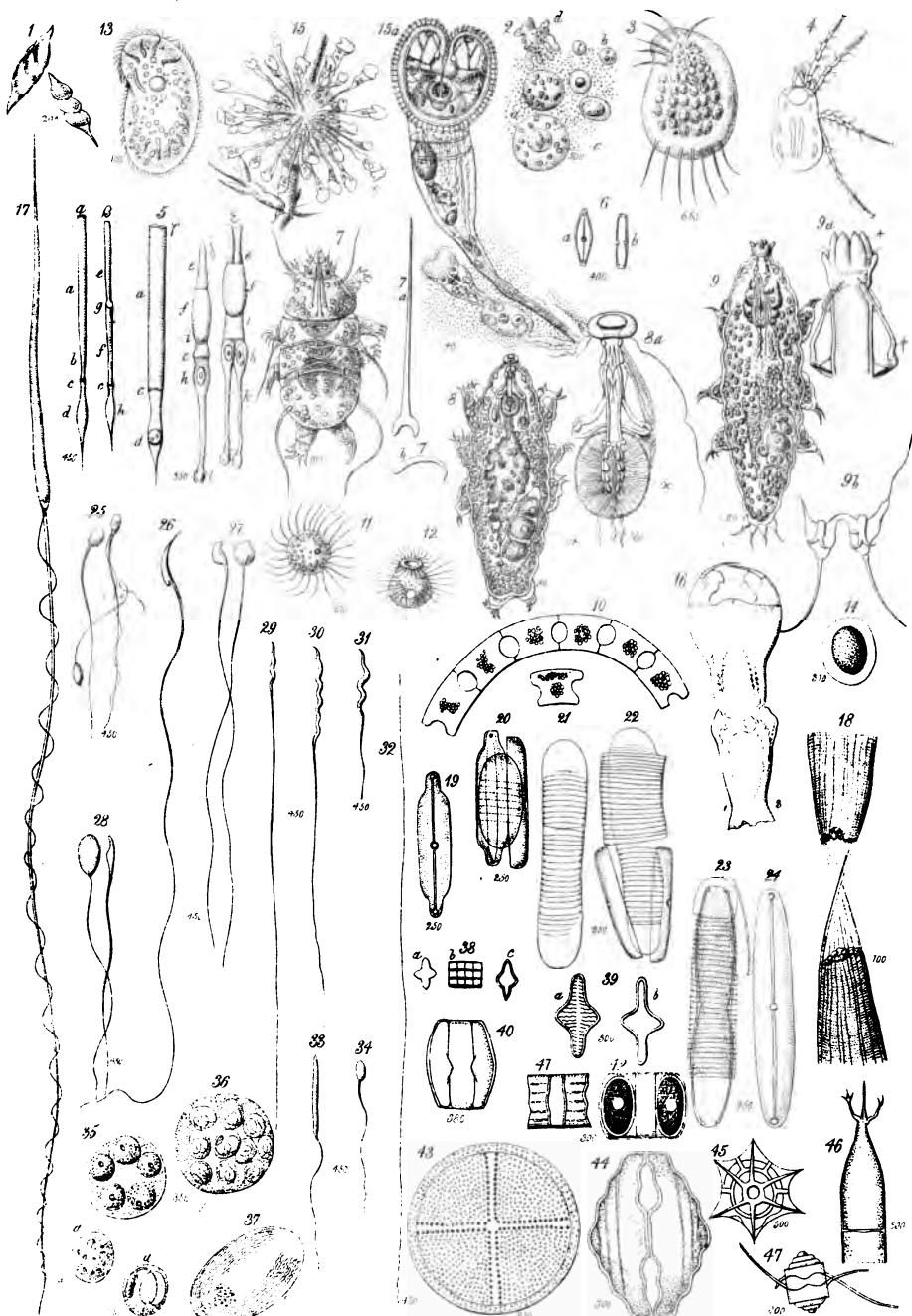




## PLATE 50.—Various Objects.

### Figure

1. *Chlorogonium euchlorum*, E., undergoing oblique division.
2. Elements of the chyle. *a*, molecules; *b*, free nuclei; *c*, chyle-corpuses; *d*, one of the same with processes.
3. *Coccidina costata*, D.
4. *Anystis ruricola*.
5. Bacilli and cones of the retina of animals. *a*, *b*, from the pigeon. *a*, bacillus; *a*, proper bacillus; *b*, its pale inner extremity; *c*, line of demarcation at the boundary of the bacillary layer; *d*, corpuscle of the outer granular layer. *b*, cone; *e*, as above; *e*, bacillus of cone; *f*, proper cone; *g*, globule of fat in the same; *h*, expansion of cone. *y*, from the frog, letters as above. *d*, from the perch, letters as above; *i*, part at which the cone usually breaks off; *k*, radial fibre; *l*, expansion of inner granular layer. *e*, twin cones.
6. *Frustulia membranacea*. *a*, valve; *b*, front view of frustule.
7. *Emydium testudo*. 7 *a*, isolated style; 7 *b*, claw of leg.
8. *Macrobiotus Hufelandi*;  $\times$  ovary. 8 *a*, Oesophageal bulb;  $\times$  its framework.
9. *Milnesium tardigrada*. 9 *a*, pharynx, with + internal buccal lobes, and  $\dagger$  styles; 9 *b*, right posterior leg, seen from beneath.
10. *Eucampia zodiaca*.
11. *Halteria grandinella*, D., seen from above.
12. *Halteria grandisella*, D., side view.
13. *Kerona polyporum*, E.
14. *Gyges granulum*, E.
15. *Lacinularia socialis*, E.; 15 *a*, the same, more magnified.
16. Mask (labium) of *Aeschna* (LIBELLULIDÆ).
17. Spermatozoa of *Triton cristatus*.
18. Sarcolemma of muscle, twisted.
- 19-24. *Navicula amphirhynchus* in conjugation. Fig. 19, side view of valve of parent frustule; 20, frustules in an early stage of conjugation; 21, sporangial sheath; 22, sporangial sheath with parent frustules attached; 23, sporangial frustule (front view), with sheath and one parent frustule; 24, side view of sporangial sheath.
25. Spermatozoa, human; one exhibiting the so-called spermatozoal membrane.
26. Spermatozoa of rat (*Mus rillus*).
27. Spermatozoa of field-mouse (*Arvicola (Hypudaeus) arvalis*).
28. Spermatozoa of rabbit (*Lepus cuniculus*).
29. Spermatozoa of goldfinch (*Fringilla (Carduelis) elegans*).
30. Spermatozoa of blackbird (*Turdus merula*).
31. Spermatozoa of wood-shrike (*Lanius rufus*).
32. Spermatozoa of a Coleopterous Insect.
33. Spermatozoa of frog (*Rana temporaria*).
34. Spermatozoa of perch (*Perca fluviatilis*).
35. Spermatic cyst of rabbit, with five globules. *a*, separate globule.
36. Spermatic cyst of rabbit, the cells or globules containing each a spermatozoon. *a*, separate globule.
37. Spermatic cyst of the common creeper (bird, *Certhia familiaris*), containing a bundle of spermatozoa.
38. *a*, *b*, *c*, *Staurosira construens*, E.
39. *Bibarium crux (leptoauron)*, E.
40. *Goniothecum gastridium*, E.
41. *Periptera chlamidophora*, E.
42. *Periptera chlamidophora*, E.
43. *Aulacodiscus crux*, E.
44. *Goniothecum odontella*, E.
45. *Actiniscus sirius*, E.
46. *Rhizoselenia americana*, E.
47. *Chaetoceros didymus*, E.



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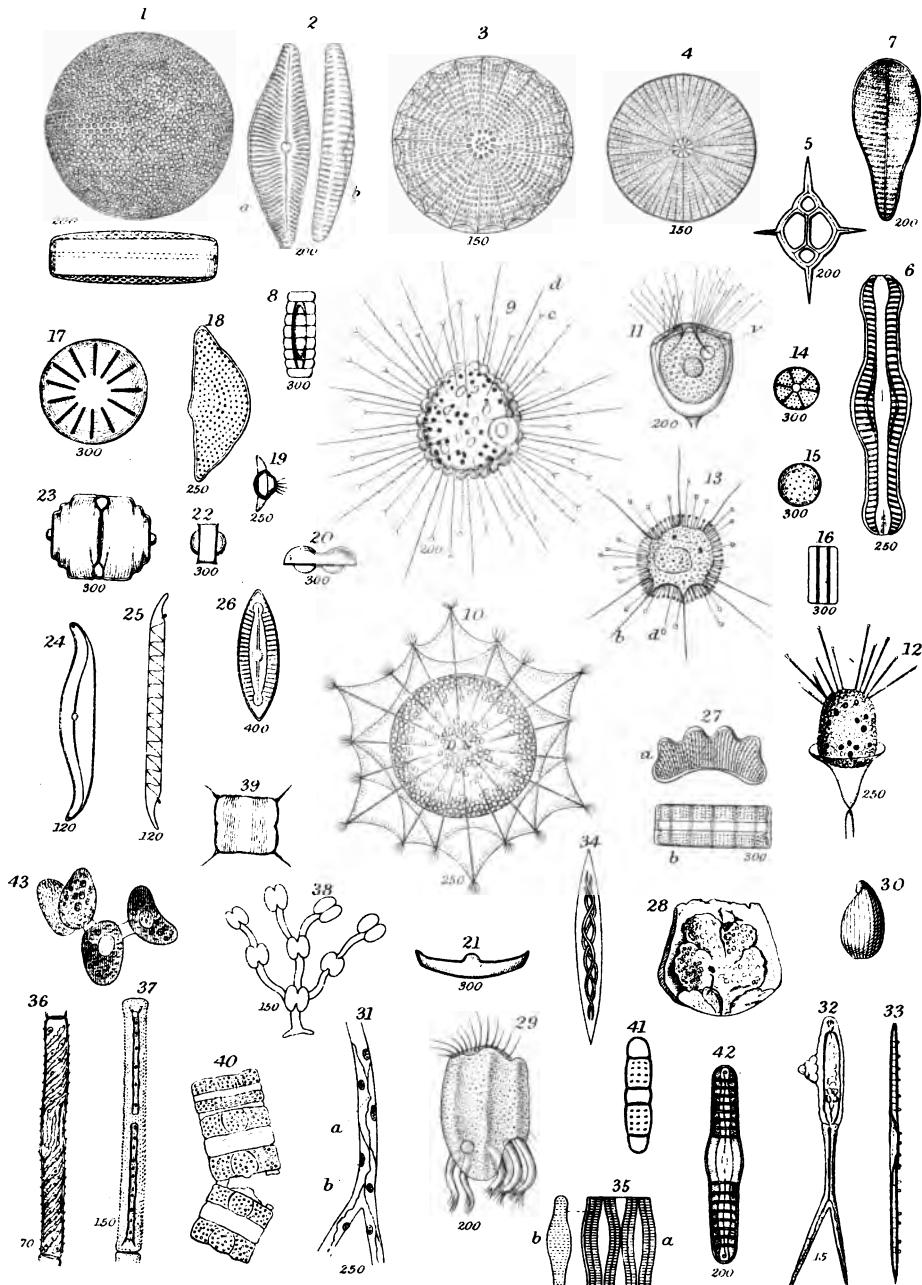




## PLATE 51.—Various Objects.

### Figure

1. *Coccinodiscus radiatus.*
2. *Cymbella Ehrenbergii.*
3. *Arachnoidiscus indicus.*
4. *Arachnoidiscus nicobaricus.*
5. *Dictyocha fibula.*
6. *Epithemia gibba.*
7. *Podoxystis americana.*
8. *Arthrogryra guatemalensis.*
9. *Acanthocystis turfacea.* *c*, forked spicula; *d*, granuliferous tentacles.
10. *Acanthometra bulbosa.*
11. *Acineta mystacina.*
12. *Acineta patula.*
13. *Actinophrys paradoxus*, with capitellate (*a*) and actiniform (*b*) tentacles.
14. *Cladogramma californicum.*
15. *Coccinosphaera discoplecta.*
16. *Disiphonia australis.*
17. *Lioslephania rotula.*
18. *Goniothecium Anaulus.*
19. *Goniothecium barbatum.*
20. *Goniothecium didymum.*
21. *Goniothecium monodon.*
22. *Goniothecium navicula.*
23. *Goniothecium Rogersii.*
24. *Toxonidea Gregoriana.*
25. *Rhizoselenia alata.*
26. *Mastoglovia lanceolata.*
27. *Eunotia tetraodon.* *a*, side view; *b*, front view.
28. *Carpenteria balaniformis.*
29. *Campylopus paradoxus.*
30. *Cadium marinum.*
31. Capillaries: *a*, cells of; *b*, nuclei.
32. *Cercaria furcata.*
33. *Clavularia Barbadiensis.*
34. *Cylindrotheca Gerstenbergeri.*
35. *Cymatosira Lorenziana.*
36. *Genicularia spirotenia.*
37. *Gonatozygon Ralfsii.*
38. *Cosmocladium pulchellum.*
39. *Attheya decora.*
40. *Hydrosera triquetra.*
41. *Plagiogramma Wallichianum.*
42. *Perizonium Braunii.*
43. *Dimorphococcus lunatus.*



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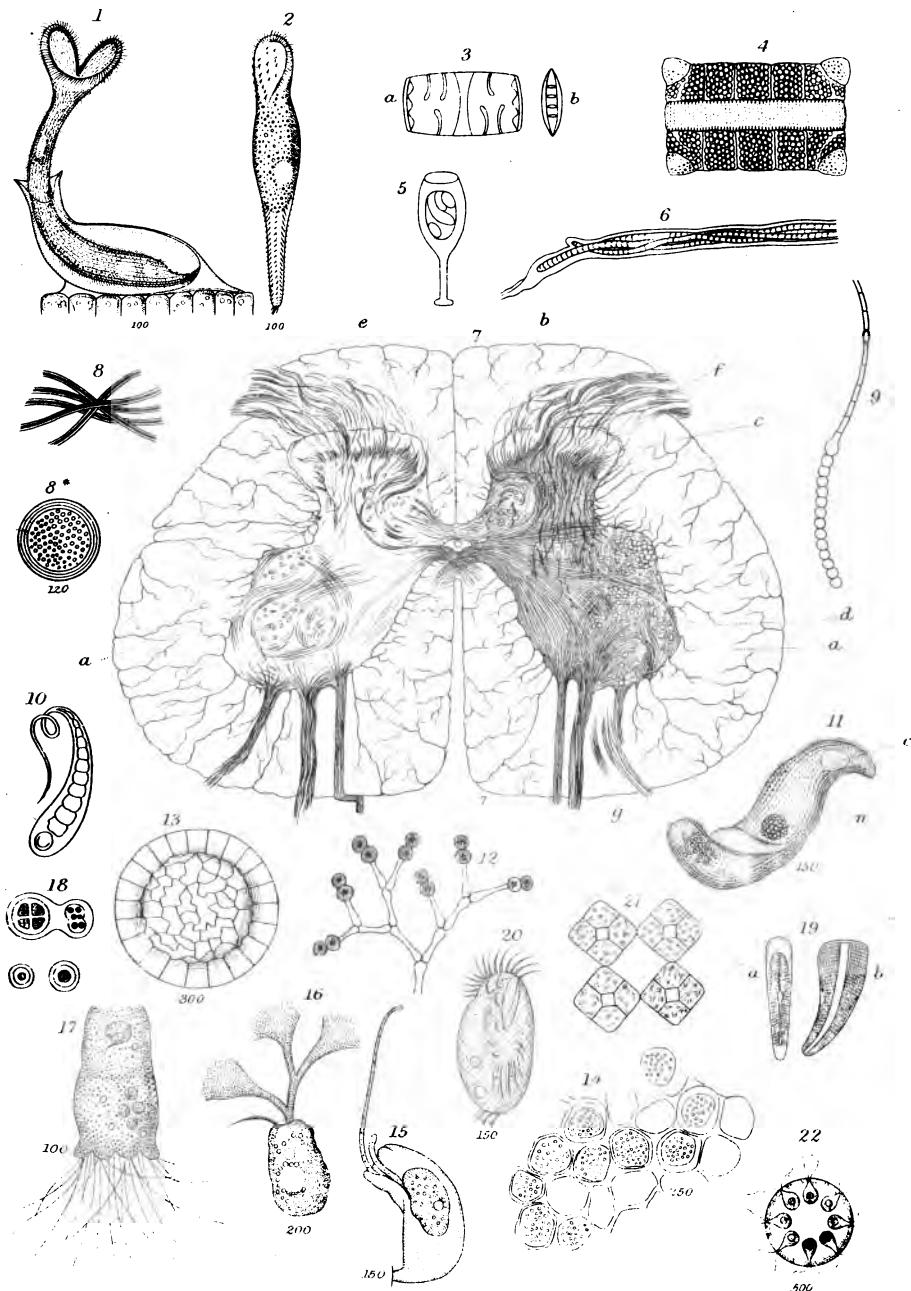




## PLATE 52.—Various Objects.

### Figure

1. *Freia elegans.*
2. *Gerda glans.*
3. *Gomphogramma rupestre.*
4. *Heibergia Barbadensis.*
5. *Hydrianum ovale.*
6. *Hydrocoleum helveticum.*
7. Transverse section of the SPINAL CORD, after Lockhart Clarke. *a*, antero-lateral columns (white substance); *b*, posterior column; *c*, posterior cornu (grey substance); *d*, anterior cornu; *e*, posterior commissure: in front is the central canal and the anterior commissure; *f*, posterior nerves; *g*, anterior nerves.
8. *Hypheothrix*, species of.
- 8\*. *Anacystis marginata.*
9. *Mastigocladus laminosus.*
10. *Mastigothrix aëruginosa.*
11. *Metopus sigmoides.*
12. *Mischococcus confervicola.*
13. *Liradiscus Barbadensis.*
14. *Limnodictyon Ræmerianum.*
15. *Urnula epistylidis.*
16. *Petalopus diffluens.*
17. *Plagiophrys cylindrica.*
18. *Pleurococcus vulgaris.*
19. *Rhoicosphenia*: *a*, *curvata* *b*, *marina*.
20. *Schizopus norvegicus.*
21. *Staurogenia quadrata.*
22. *Stephanosphaera pluvialis.*



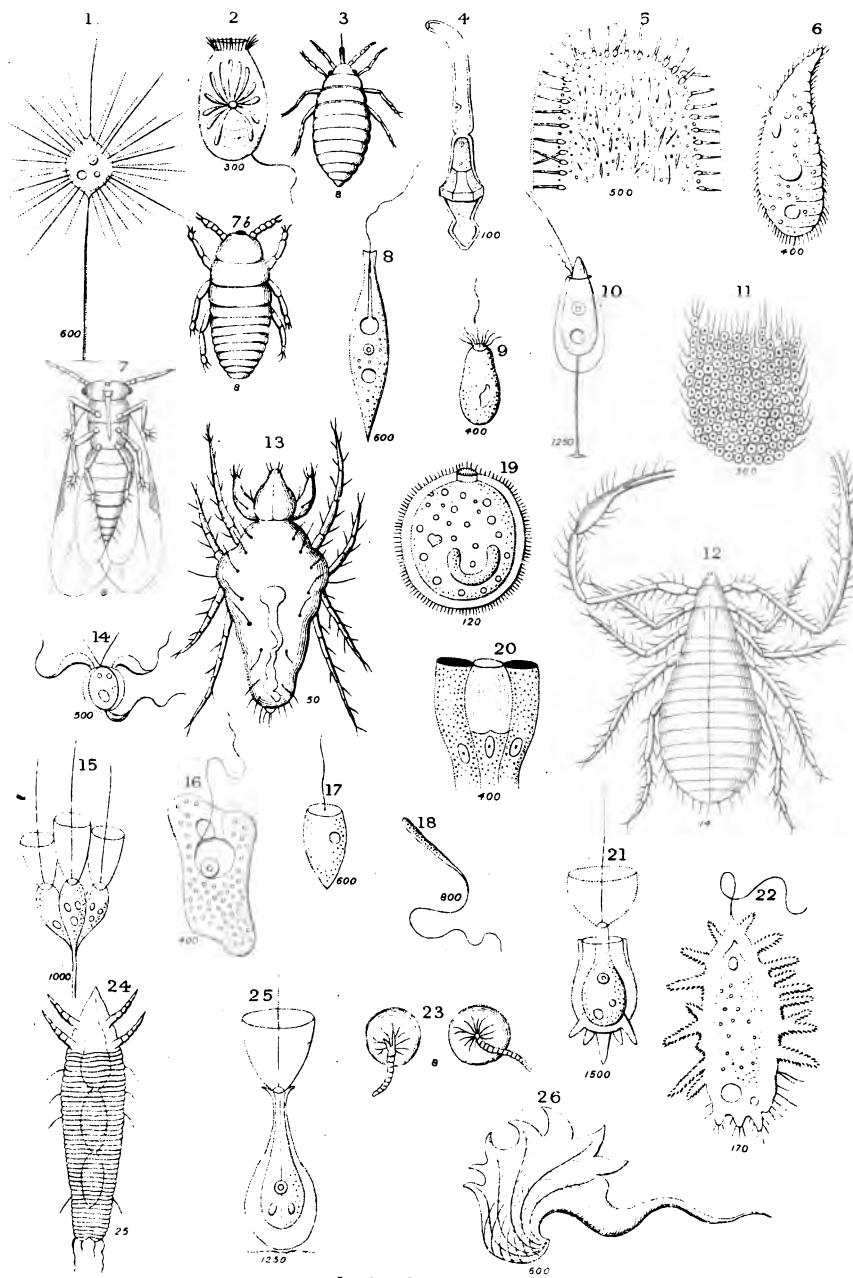




## PLATE 53.—Various Objects.

### FIGURES

1. *Leptothrix* *varicosa*.
2. *Leptothrix* *varicosa*, with nuclear prolongations.
3. *Leptothrix* *varicosa*.
4. *Leptothrix* *varicosa*, *longa* form.
5. A young, slender portion of cell of the pink of the fig-tree, lined with *Amylobacter*.
6. *Leptothrix* *varicosa*.
7. *Leptothrix* *varicosa*.
8. *Leptothrix* *varicosa*.
9. *Leptothrix* *varicosa*.
10. *Leptothrix* *varicosa*.
11. *Leptothrix* *varicosa*.
12. *Leptothrix* *varicosa*.
13. *Leptothrix* *varicosa*.
14. *Leptothrix* *varicosa*, attached to a cell of *Prostomium*.
15. *Leptothrix* *varicosa*.
16. *Leptothrix* *varicosa*.
17. *Leptothrix* *varicosa*.
18. *Leptothrix* *varicosa*.
19. *Leptothrix* *varicosa*.
20. *Leptothrix* *varicosa*.
21. *Leptothrix* *varicosa*.
22. *Leptothrix* *varicosa*.
23. *Leptothrix* *varicosa*.
24. *Leptothrix* *varicosa*.
25. *Leptothrix* *varicosa*.
26. *Leptothrix* *varicosa*.





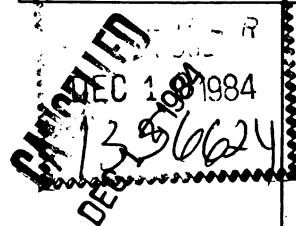








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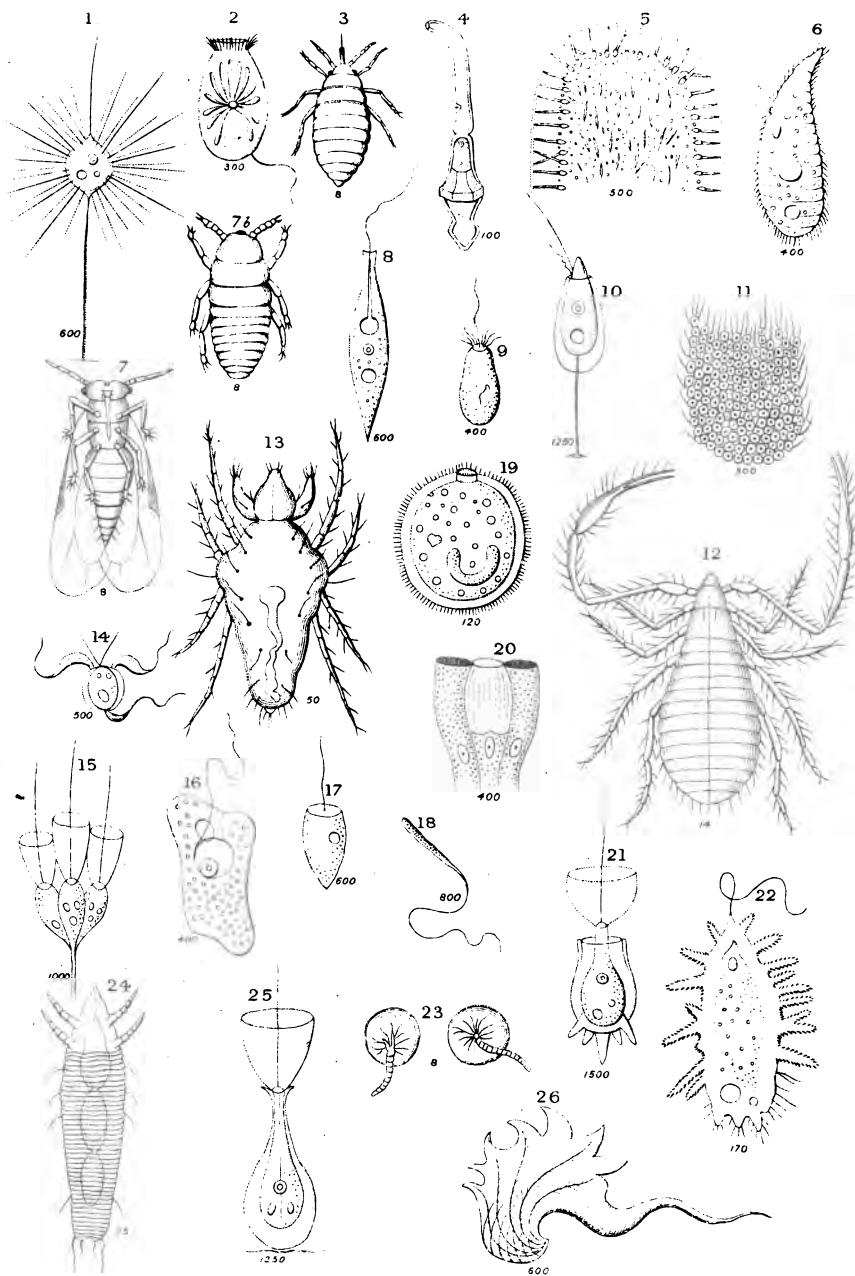
## PLATE 58.—Various Objects.

### Figure

1. *Actinomonas mirabilis*.
2. *Amphidinium operculatum*, with nuclear prolongations.
3. *Eriosoma lanigerum*.
4. *Anchylostoma dysenterica*, fem.
5. *Amylobacter*; portion of cell of the pith of the fig-tree, lined with *Amylobacter*.
6. *Anophrys sarcophaga*.
7. *Phylloxera vastatrix*.
8. *Atractonema teres*.
9. *Asthmatos ciliaris*.
10. *Bicosceca lacustris*.
11. *Capsosira Brebissonii*.
12. *Chelifer caneroides*.
13. *Cheyletus eruditus*.
14. *Colpodella pugnax*, attached to a cell of *Protococcus*.
15. *Codosiga botrytis*.
16. *Cælomonas grandis*.
17. *Cyathomonas spissa*.
18. *Herpetomonas Lewisii*.
19. *Ichthyophthirius multifiliis*.
20. Goblet cells (p. 439).
21. *Lageneca cuspidata*.
22. *Mastigamoeba aspera*.
23. *Noctiluca miliaris*.
24. *Phytopodus tiliæ*.
25. *Salpingæca amphoridium*.
26. *Trypanosoma sanguinis*.

VARIOUS OBJECTS

Pl 53.



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